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Net Benefits of Increased Agricultural Trade Liberalization to the Canadian Economy

by

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Vincent Amanor-Boadu, Jill Hobbs, Zana Kruja and Larry Martin

Executive Summary

The Next Round of multilateral trade negotiations under the World Trade Organization is set to begin towards the end of 1999. This study was initiated to inform, substantiate and aid the development of industry and government negotiation positions for the Round. It was sponsored by Agricore, Alberta Agriculture and Food Council, Alberta Agriculture, Food and Rural Development, Alberta Intergovernmental and Aboriginal Affairs, the Alberta Sugar Beet Growers, the Canadian Dehydrators Association, the Canadian Oilseed Processors Association, and the Potato Growers of Alberta.

Its overall objective was to quantify the net benefits from agricultural trade liberalization in the Next Round of the WTO. The specific objectives may be encapsulated as follows:

1. Assess the relative sizes of the supply managed and non-supply managed segments in Canada's agri-food sector with the view to understanding the implications of trade liberalization on these segments.
2. Examine the implications of trade liberalization on trade by degree of value-adding.
3. Estimate the extent and distribution of government support to agriculture in Canada on a regional basis.
4. Quantify the net benefits from elimination of tariffs and other trade barriers to the agri-food sector and the economy.
5. Evaluate the impact of emerging trade issues (e.g., food safety, genetically modified organisms and biotechnology) on Canada's agri-food industries.

Scenarios

We defined three principal scenarios for the quantitative analysis: the base scenario, described as continuing the Uruguay Round of tariff reductions in the next round; 20-year and 10-year tariff sunset scenarios, where we structured all agricultural tariffs to be completely eliminated in 20 and 10 years respectively after the next round came into effect. The implementation date for the next round was assumed to be 2005. We defined net benefit as the difference between net revenues under the sunset scenarios and the base scenario. Net revenues were estimated as the sum of net incomes at the farm, processing and export levels of each industry within the sector.

Principal Methodology

The system dynamics modelling (SDM) technique is the principal analytical tool used in this research. It was chosen because of its inherent dynamic character which allows for the incorporation of feedbacks and multiple cross-effects with limited demand on data. It also "required" and utilized the expertise and experience of industry stakeholders in assessing future policy changes and their reactions to these policy changes. Hence, the SDM approach enabled us to mimic "reality"of liberalized trade environment as much possible.

Selected Industries

Ten agri-food industries were selected for inclusion in the model. They were selected on the basis of their size, exposure to international trade and the extent of potential impact of policy changes. They are barley, beef, canola, chicken, corn, eggs, dairy, pork, soybean and wheat. We modelled production and processing in these industries with the exception of the grain industries (barley, corn and wheat) where data limitations prevented modelling of the processing level. Also, data limitations prevented us from modelling value-added products that included products from more than one industry.

Data Requirements and Sources

The model's requirements encompassed quantity data (quantity of various products at the production, processing and trade levels), price data (farm prices, domestic wholesale prices, international prices and exchange rates), policy and technical parameters (elasticities, costs of production, technical coefficients and tariff decline rates). These data were obtained from various sources (Statistics Canada, Industry Canada, Agriculture and Agri-Food Canada (AAFC) and the USDA, Canadian Imperial Bank of Commerce, Canada Beef Export Federation, the Dairy Farmers of Canada, Dairy Farmers of Ontario, Canadian Meat Council and Canadian Pork Council). Base run price elasticities of demand and supply were obtained from Roningen and Dixit (1989) and Tyers and Anderson (1992). Sunset scenario elasticities were estimated from conversations with industry leaders in Delphi group setting.

Model Assumptions

The model was facilitated by a number of assumptions. For example, we assumed that prices were exogenously determined because Canada is a small country and does not *technically* influence world market prices for most commodities. We assumed that all members would comply fully with the liberalization commitments modelled. We also assumed that there will be no upheavals over the simulations period and technological advances will continue for all agri-food industries. We assumed homogeneity of agri-food products in all industries and, therefore, did not model differentiated products within each industry.

Simulation Results

The model was simulated over twenty years (2005 to 2024) for all three scenarios. The results of the sunset scenarios were compared with those of the base scenarios to determine the net benefit to the agri-food sector. The results showed that elimination of all tariffs and non-tariff barriers yielded positive net benefits for the Canadian agri-food sector. For example, total trade liberalization under the ten-year tariff sunset scenario yielded a cumulative net benefit of $50.21 billion over twenty years. The cumulative net benefit under the 20-year scenario was $21.64 billion.

Exhibit 1 summarizes the net benefits of trade liberalization to Canada's agri-food industries under the two sunset scenarios, showing the average annual net revenues under the base scenario as a reference. The ratio of net benefit to base scenario net revenue is a measure of the trade liberalization effect (TLE). We may interpret these as the change in base scenario net revenues resulting from the implementation of the tariff sunset policies. The exhibit shows that the canola industry had the highest positive TLE

Exhibit 1: Summary of Net Benefits by Industry

Industry	Base Scenario Net Revenue ($ million) (1)	Average Annual Net Benefit ($ million)		TLE Indicator*	
		20-YEAR (2)	10-YEAR (3)	20-YEAR (4) = (2)/(1)	10-YEAR (5)=(3)/(1)
Barley	1,587.33	76.87	236.16	4.84%	14.88%
Beef	4,535.46	340.79	1,126.35	7.51%	23.10%
Canola	3,053.76	160.70	485.64	5.26%	15.11%
Chicken	5,658.43	(112.61)	(289.81)	-1.99%	-5.23%
Corn	689.99	26.70	79.74	3.87%	11.13%
Dairy	8,204.51	(78.80)	(309.36)	-0.96%	-3.81%
Eggs	513.44	(58.21)	(150.19)	-11.34%	-32.99%
Pork	3,685.05	578.88	833.77	15.71%	19.55%
Soybean	882.28	31.98	75.49	3.62%	8.26%
Wheat	4,023.86	115.85	422.69	2.88%	10.21%
Total	**32,834.11**	**1,082.15**	**2,510.50**	**3.30%**	**7.65%**

* Trade Liberalization Effect (TLE) Indicator is measured by dividing the respective average annual net benefit by the base scenario net revenue. It shows the average annual percentage change in the net revenues under the base scenario due to the implementation of a tariff sunset policy.

(27%), followed by the beef and pork industries with 23% and 20% respectively under the 10-year scenario. The egg industry had the highest negative TLE (-33%) compared to -5% for the chicken industry and -4% for the dairy industry under the 10-year scenario. The high reduction in average annual net egg revenues is a result of two reinforcing factors: (1) increasing breaker share of the total egg market which implied a reduction in the weighted egg price received by producers and (2) declining production resulting from the market conditions. Under the 20-year scenario, the TLEs were much smaller.

The total average annual net benefit for all the selected industries is positive at $1.1 billion and $2.5 billion under the 20-year and 10-year sunset scenarios respectively. The total TLE for the selected industries was about 7.7% under the 10-year sunset scenario and 3.3% under the 20-year sunset scenario. This indicates that there is significant net benefit to the agri-food sector, and to the Canadian economy, as a result of trade liberalization in the agri-food sector.

We believe that the foregoing actually underestimates the net benefits of trade liberalization because of three major reasons: (1) we assumed homogeneity which did not allow us to incorporate the higher benefits accruing from higher value-added products such as consumer-ready products which used inputs from more than one industry; (2) we did not include processing in the grain industry because of data constraints; and (3) we assumed the structure and types of industries that exist today will be the same as those in existence twenty-five years from today.

Relaxing the homogeneity assumption will increase the net revenues in all the industries as differentiated products that command higher value are recognized. For example, trade liberalization could create opportunities for the Canadian dairy industry to increase its net revenues from milk ingredients as well as specialty ice-cream, yoghurt and cheeses. Thus, it is expected that including these higher value-added products would reduce the negative supply managed industry net benefits and increase the estimated net benefits for the other industries.

The grain industries contribute to many industries – bakery and confectionery, beverages, sweeteners, etc. However, there is virtually no data on the contribution primarily because of the nature of these contributions. Therefore, our analysis focussed only on grain production and trade, without capturing the high value-adding that involves grain, i.e., baking flour, beer, liquors, sweeteners. This seriously underestimates the net revenues for the grain industry because a proportion of the increased production and trade of these high value products emanating from the elimination of tariffs could be allocated to the grain industry.

New uses for agri-food products are becoming increasingly important sources of revenue in the sector. For example, the structural qualities of building materials are being developed from wheat straw and different forms of particle boards are being developed from various grain by-products. Also, cosmetic and pharmaceutical products are being developed from food-based ingredients because of their higher yield and natural properties. Additionally, biotechnology is facilitating the development of new products from traditional agri-food products. For example, various nutraceuticals and phytochemicals are emerging from such vegetable and grain products as broccoli, wheat and tomatoes. Our projections did not account for any of these changes in the agri-food industry, leading to potential underestimations of the total net benefits that were estimated.

The agri-food industries' ability to achieve the estimated net benefits under an increased trade liberalization regime depends critically on the full compliance by all WTO members to the defined rules of trade liberalization. To assess the extent of non-compliance on Canada's agri-food net benefits from trade liberalization, we investigated the impact of the US applying its Export Enhancement Program to barley exports into a third country where Canada was also exporting. The effect was a dramatic reduction in the net benefits accruing to barley resulting from depressed international barley prices. This fed back into the domestic market, leading to increased canola production and increased net benefits for barley-consuming livestock industries.

Also, using sanitary and phytosanitary measures, especially those related to genetically modified organisms (GMOs) and biotechnology, as trade barriers could have significant negative net benefit effect on the Canadian agri-food industries because of the relatively high adoption level of such technologies in Canada. We showed that a ban on GMO canola exports for only a few years could have long-term effect in the oilseed production and processing industries. The need for clarification of rules and enforcement of agreement cannot be overemphasized if the estimated net benefits are going to be realized.

Other Results

In addition to the net benefits of agri-food trade liberalization, the study required the estimation of the distribution of Canada's agri-food economic situation along supply managed and non-supply managed lines to shed light on the implications of trade policy changes on the sector. Additionally, we projected the trend in consumer-ready products' exports outside the system dynamic model and assessed the trends in government transfers to agriculture. These results are summarized below.

Canada's supply managed industries account for about 21% of total agri-food net revenues (farm and processing). At the farm level, they account for about 27% of total net revenues while their share at the processing level was estimated as 18%. The non-supply managed industries accounted for 74% of total net farm income and 82% of total manufacturing value added. Their combined share of total agri-food net revenues (farm and processing) is 79.4%.

Since the Canada-US Free Trade Agreement, there has been a change in the composition of Canada's agri-food exports in favour of consumer-ready products. These products are often several time more valuable than commodity or bulk products. Since many countries' tariffs increase with the degree of processing (e.g., higher tariffs on refined canola oil compared to canola), eliminating tariffs in a global trade agreement could lead to a similar shift in composition for Canada's non-US trade. In the absence of any policy changes, and based solely on historical performance, we estimated that Canada's consumer-ready product exports could reach $34 billion in 2008, from its current value of about $9 billion. Achieving the elimination of all tariffs, especially those on high value consumer-ready products, could increase this estimate significantly.

Government transfers to agriculture are declining, and the regional distribution is changing. For example, total agri-food transfers to agriculture decreased by about 50.1% between 1991 and 1996, and the share the western provinces decreased from 60% to 54.5% in the same period. The Canadian public policy on farm support has changed and it is important that we work through the impending trade negotiation to bring those of our trading partners in line.

Moving Forward

Canada's federal and provincial government as well as its agri-food industries have long expressed their concern over the apparent *difficulty* in developing coherent trade negotiating positions for agriculture. On the surface, developing such positions has seemed impossible given the dichotomy of interest that is perceived to exist between supply and non-supply managed industries. However, since the results of

our analysis indicate that the dairy and broiler chicken farm levels both had positive net benefits from trade liberalization, there is a need to reassess traditional views about trade liberalization.

A look at expectations from the negotiations indicates that industry stakeholders are aware of irreversible direction of tariff reductions and trade liberalization, and are all seeking a negotiation outcome that provides a predictable and a rules-based international trade milieu. They all recognize the need for securing fair market access to increase their market sizes and net incomes and they all want to minimize the trade distorting effects of such policies as export and domestic subsidies. Conversations with various industry leaders and a review of position papers released by various agri-food industries support these observations. The question then is this: What needs to be done to coalesce the various industry positions into a sound and compelling Canadian agri-food negotiation position?

To achieve this, we believe the things that unite Canada's agri-food industries' expectations from the Next Round should be the focal point for developing a single non-ambiguous and credible position. Industry stakeholders should, therefore, rally around the major issues – market access, export and domestic subsidies, and sanitary, phytosanitary measures and dispute settlement – and forge a position that seeks to a strong, transparent, rules-based international trading system. Agri-food stakeholders should encourage Canada's negotiators to align Canada with like-minded countries to develop a trade environment that has a high cost for non-compliance to the Agreement. The general belief among agri-food stakeholders is that history has shown their ability to be ingenious and succeed. They point to the Ontario's processing tomato industry and the B.C. and Ontario wine industries over the past decade in reinventing themselves from predicted doom to high international competitiveness and say "We can do it again."

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The multi-industry and long range dimension requirements of this research exceeded the rational skills of any individual. We, therefore, depended on the knowledge and skills of many people to help us define some of the parameters we used in the quantitative sections of the research.

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- Potato Growers of Alberta

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Net Benefits of Agricultural Trade Liberalization to the Canadian Economy

1.1 The Uruguay Round and Canada's Negotiation Strategy

The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) marked the first time agriculture became subject to the disciplines of international trade rules. After six years of negotiations, the GATT reached agreement on agriculture and about a dozen other areas, such as Understanding on Rules and Procedures Governing the Settlement of Disputes, Agreement on Trade-Related Investment Measures, Agreement on the Implementation of Article VI (Anti-Dumping), and Agreement on Subsidies and Countervailing Measures. The Agreement on Agriculture had four specific components:

- Market access
- Minimum access
- Export and domestic subsidies
- Sanitary and phytosanitary measures.

In watching the early part of the Uruguay Round of GATT Negotiations, Schmitz (1988) pointed out the sometimes conflicting roles special interest groups played in international trade negotiations. But since trade liberalization also leads to reduced government support, special interest groups receiving such support often position themselves against trade liberalization, even when there are overall benefits to the economy.

The market access component of the Agreement on Agriculture required member nations to replace all non-tariff barriers with tariff equivalents. The conversations leading up to the agreement focussed significantly on the implications of such tariff equivalents on industries protected under Article XI (ii) c (1). While these conversations were required, there are some within Canada's agri-food sector who believe that the conversations were overwhelmingly focussed on the supply managed industries, subsequently leaving little time for other industries. Canada not getting US sugar tariff rate quotas, despite its special trade relations under the Canada-US Free trade Agreement (FTA) is cited as an example the losses Canadian agri-food industries incurred under the Uruguay Round negotiations.

The next round of negotiations is set to commence in late1999. It is important that Canada's agri- food stakeholders set the stage for debate, conversation and strategy development to allow them to maximize the return on their negotiation resources. Agriculture and Agri-Food Canada developed a discussion paper to provide information for some of these conversations, as have some of the provinces (Ontario for example). This research is one contribution of the Government of Alberta and its industry partners to the effort to increase awareness about the principal issues and potential implications in the Round.

1.2 Project Objectives

The overall objective of the research is to provide quantitative estimates of the net benefits to the Canadian economy from increased agricultural trade liberalization that could occur in the next round of WTO Negotiations. The research seeks to answer three major questions:

1. What will be the net benefit to the major Canadian agri-food industries when agricultural trade is fully liberalized?
2. What is the total net benefit to Canada's agri-food industries when agricultural trade is fully liberalized?
3. If the total net benefits in the agri-food sector under a total trade liberalization scenario are negative, will the net benefits for the rest of the economy be large enough to over- compensate, making the total Canadian economy better off under full trade liberalization?

These questions are aimed at aiding the broad understanding of trade liberalization on Canada's agri-food industries, as well as seeking solutions to potential negative impacts of trade liberalization.
The specific objectives are identified as follows:

- Quantify the proportion of Canada's agri-food sector that is reliant on trade and that is currently subject to substantial barriers to access including tariffs and non-tariff barriers or to competition from export and domestic subsidies.
- Determine the relative proportion of Canada's agri-food sector that is "market-based" as compared to "highly regulated and protected," i.e., regulated through the use of high tariffs, TRQs, quotas and government marketing regulations.
- Examine and compare the future trends in demand including foreign versus domestic, and product categories (bulk, industrial and consumer-ready (BICO)) in the context of the need to focus reductions in tariffs on processed foods.
- Estimate the extent and distribution of government support to agriculture in Canada on a regional basis.
- Quantify the potential benefits from the elimination of key tariff and non-tariff barriers to both export and import trade.
- Estimate the cost of full market liberalization for Canada's agri-food sector.
- Quantify the effects of the full elimination of export subsidies for Canadian agriculture.
- Estimate the net economic effects of adjustments to full trade liberalization.
- Evaluate how some of the expected new issues in the WTO (e.g., food safety, genetically modified organisms and biotechnology) can influence the above results for Canada's agri- food industries.

1.3 Methodological Issues

The objectives require that analysis be done at various levels of aggregation in the economy. This creates a particularly significant problem when the theoretical, measurement and statistical dimensions of the problem at hand are incongruent. For example, the effects at the farm or firm level can be very different from what is observed at the industry and sector levels due simply to the limitations of aggregation and the potential for the "error of over-abstraction" (Castrogiovanni, 1991). This "error" includes issues about the fact that all businesses are not the same, do not react the same and that when all of them react, the outcome may be very different than was anticipated by each individual. The error of over-abstraction is compounded when a systems approach is used in conducting the analysis. The systems approach recognizes the linkages among various firms and industries, attempting to replicate the reality of businesses (FitzGerald and FitzGerald, 1987).

The principal objective of the research is to determine the net benefits from a policy change that has not yet occurred. This gives it a futuristic dimension that introduces its own problems – problems with how the future is going to look like twenty-five years from 1999. As a result, we had to project prices as well as technological changes over that period. In simulating potential benefits from change, it is important to reflect the behaviour of the economic principals and agents in the face of the change variables. Given the diverse nature of the players in the Canadian agri-food sector (firms, industries, regions, etc.), it is virtually impossible to accurately model this. We *over-abstracted* and used a single *static* parameter to define this response to change – a supply response parameter. The question that arises is this: Can this parameter accurately reflect the collective response of the economic agents the model seeks to recognize?

These methodological issues present some significant data limitations in terms of availability and quality. They also open up opportunities to model the questions that we seek to answer in a variety of ways. We present the approaches and assumptions used to address these methodological issues in Section 5.

1.4 Scope of Research

The scope of the research is confined to industries chosen on the basis of their contribution to total agri-food sector revenues, the extent of international trade, their role as inputs to other production, the degree of protection accorded under the current Uruguay Round Agreement and availability and reliability of data. Using these criteria, the selected industries are as follows:

1. Wheat
2. Barley
3. Corn
4. Soybean, soybean oil and meal
5. Canola, canola oil and meal
6. Beef
7. Pork
8. Broiler Chicken
9. Eggs
10. Dairy (Cheese)

The selected crop industries accounted for about 62% of total farm cash receipts from field crops in 1997, while the livestock industries accounted for 93% of receipts from livestock production. All the grain and oilseed products are traded internationally: e.g., Canada's canola production accounted for about 18% of total global production, while its exports accounted for about 44% of global exports in 1997 (USDA). Similarly, Canada's beef production accounted for about 1.5% of world production, and 6.7% of world exports (USDA). Chicken and dairy are not as heavily traded. For example, Canadian chicken production and exports accounted for 1.7% and 1.1% of world production and exports respectively, while Canada's cheese production and exports respectively accounted for 2.54% and 0.74% (USDA).

1.4 Organization of the Report

The next section presents an overview of the Uruguay Round of GATT and evaluates the performance of trade since the Agreement came into force. We look specifically at trade performance with respect to bulk, intermediate and consumer-ready products (BICO) and provide some indications, given the changing trade and economic environments, about the composition of Canada's agri-food trade in the future (Objective 3).

In Section 3, we examine the relative importance of supply managed and non-supply managed industries in the current and future trade environments. We do this from the perspective of their contribution to the total agri-food gross domestic product (GDP). Section 3, therefore, addresses the requirements of Objectives 1 and 2 of this research.

Section 4 addresses the extent and distribution of government support for agricultural industries across the provinces (Objective 4). This is an important issue from the perspective of trade liberalization given the *required* reductions in government support programs (in volume and value) to producers. It also allows us to assess the overall implications of the policy change on producers in the various regions of the country. Section 5 presents the assumptions underlying the system dynamic model used to conduct the quantitative analysis of the changing tariff environment on the selected agri-food industries, the results of which are presented in Section 6. Also in Section 5, we present a detailed overview of tariff and non-tariff barriers to trade that are a focus in the literature and could be important negotiation points in the Next Round of WTO.

The results of policy shocks, such as domestic and export support programs in major agri-food countries, are assessed in Section 7. The issues surrounding food safety, genetically modified organisms and biotechnology are also discussed in this section. Thus, Sections 6 and 7 cover Objectives 5, 6 and 7. Section 8 is divided into two broad segments. The first presents an assessment of the overall impact of trade liberalization on Canada's agri-food industries (Objective 8), bringing together the tariff and non-tariff effects on the selected industries as well as the broader agri-food sector. The second segment of Section 8 is the study's summary and conclusions.

2.1 An Overview of Agri-Food Trade Performance Under Changing Trade Rules

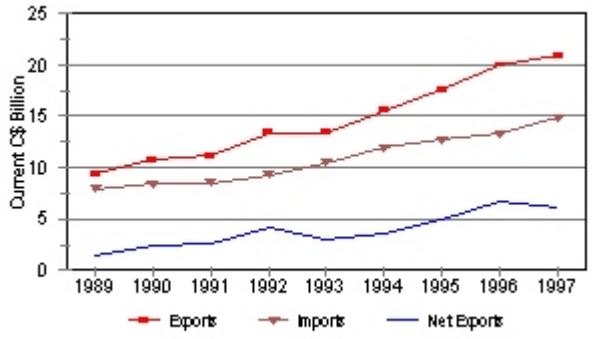
The rules of engagement of the Uruguay Round required that an agreement be reached on all aspects of the Round if there was going to be an Agreement. This "all or none" approach to the negotiation was a unique aspect of the Uruguay Round, and may, at least in part, explain the seemingly long (almost seven years) negotiation duration.

In this section, we look at Canada's trade performance in the presence of tariff reduction and/or elimination. This provides some indications of how further reductions, and ultimately elimination, of tariffs under the WTO could affect Canada's agri-food industries. The analysis of Canada's international trade situation over the past decade will be conducted at three levels of processing: (1) Bulk commodities; (2) Intermediate products; and (3) Consumer-ready products.

2.2 Canada's Agri-Food Trade Performance

Figure 2.1 illustrates the trend in Canada's agriculture and agri-food trade between 1989 and 1997. The figure indicates an upward trend for imports, exports and net exports for the period under consideration. Total agri-food exports was $20.9 billion in 1997 compared to about $9.3 billion in 1989. It exhibited an average annual growth rate of about 10% over the period under consideration.

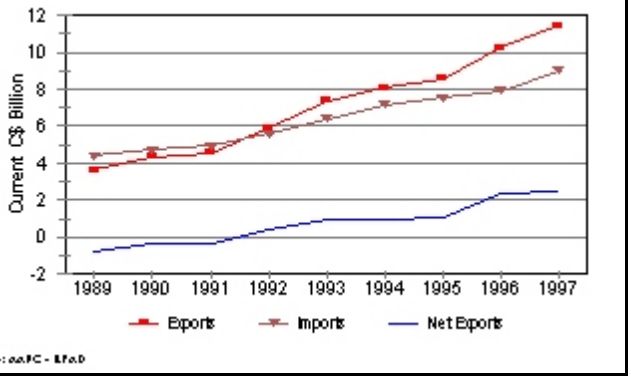
Figure 2.2: Canada's Total Agri-Food Trade



Total agri-food imports grew at an average rate of about 8%, increasing from $7.9 billion to $14.9 billion. Net exports increased from $1.5 billion in 1989 to $6 billion at an average annual growth rate of 16%.

The fundamental question that we pose is how these trends will change with even more decline in trade barriers. We may learn how the future looks with the rest of the world by examining how Canada's trade with the US has changed since the FTA.

Figure 2.3: Canada's Agri-Food Trade to the US



We illustrate the trend in Canada's agri-food trade with the US between 1989 and 1997 in Figure 2.2. Exports increased by about three times from $3.6 billion in 1989 to $11.4 billion at an annual growth rate of 14%. Imports also more than doubled, from $4.4 billion to $9 billion and at an average growth rate of 9%. Canada's net trade went from a $790 million

Figure 2.4: Net Exports to the US for Grains, Oilseeds, Animal and Meat Products

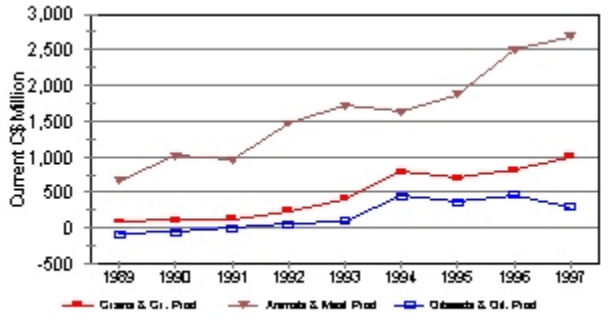
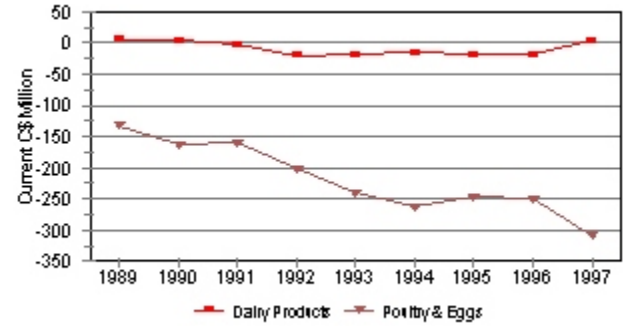


Figure 2.5: Net Exports to the US for Dairy, Poultry and Egg Products



deficit to a $2.4 billion surplus in 1997.

Figure 2.3 shows an increasing trend in net exports for the grains and grain products, animal and meat products, and the oilseeds and oilseed products industries. Average growth rates are 26% per annum for grains and grain products, 15% for livestock and meat products, and 40% for oilseeds and oilseed products.

Figure 2.4 illustrates the trends in the net export position of Canada's supply managed industries. Given the nature of the policy establishing these industries, there is relatively little trade activity. However, what is observed is a relatively flat trend for dairy and a declining trend for poultry and eggs.

To succeed at taking advantage of decreasing tariffs and non-tariff barriers to trade, Canada's agri-food sector stakeholders must focus on enhancing their competitiveness in the global marketplace by increasing their share of total global agri-food exports. Figure 2.5 shows that Canada's share of the global agri-food market has been declining over time. The average annual decline is about 3.2%. When we put this situation of declining share of total agri-food exports together with the fact that Canada's agri-food exports have been increasing, we see that other countries are doing better at global agri-food competitiveness (measured by market share) than is Canada's agri-food sector. There is need to identify processes for arresting this decline and turning it around. The emerging global conditions suggest that this cannot be done with trading bulk commodity products, that the focus should be on high value-added, consumer-ready products. How has Canada been performing with respect to its consumer-ready products' trade? We now turn our attention to this.

Figure 2.6: Canada's Share of World Agri-Food Exports

2.3 Canada's Trade Performance by Degree of Value-Adding

By redefining the trade data into bulk, intermediate and consumer-ready (BICO), we assess how Canada's agri-food sector has performed over the past decade with respect to the degree of value-added products it is exporting. We use this to compare the trends in Canada's BICO trade with the US against the rest of the world. This allows us to evaluate the implication of tariff escalation and the reduction/elimination of tariffs on trade activity in high value-added products vis-a-vis bulk and intermediate commodities. We extrapolate the direction of Canada's trade in such products from the historic analysis.

Figure 2.6 shows the trends in Canada's agri-food exports to the US by degree of value-adding. Consumer-ready products are the largest category and have the fastest growth since the beginning of the FTA. This results from the fact that tariffs were reduced most and the most market access was gained in the higher value categories. Canadian exporters have responded to the opportunities by increasing exports of the higher value products.

Figure 2.7: Canadian Agri-Food Exports to the US

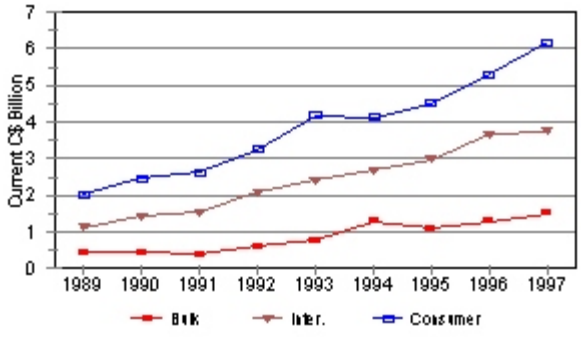
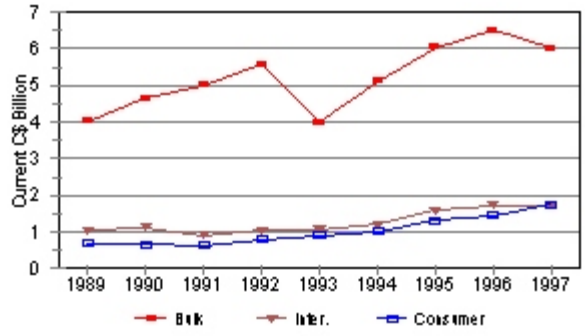


Figure 2.7 shows that Canada's agri-food exports to the rest of the world (ROW) have a very different pattern. Bulk commodity exports made up the largest share. This is due to generally high trade barriers in importing countries on value added products and low barriers on bulk products. Most importing countries adopted tariff escalation (i.e., high tariffs on value-added products and low tariffs on bulk products) to encourage value adding in their own markets. In a sense, Canada became a shipper of bulk products because this was the market signal received from markets that hid behind major trade barriers.

Figure 2.8: Canada's Agri-Food Exports to the ROW



It is very interesting to note that export growth began to occur in Canada's intermediate and consumer-ready categories in the first year of the phase-in of the Uruguay Round in 1995. Thus, Canada's agri-food industries have already responded to changing trade environment, despite the relatively modest reduction in tariffs. The average growth rate in Canada's consumer-ready product exports to ROW since 1995 is 22.5%, supporting the expectations that tariff reductions favour growth in value added exports.

How high may these exports rise over the next decade? We used historical data to forecast them with simple trend equations estimated from 1989-1997. This likely gives a conservative view of future growth in consumer-ready exports because trade barriers will continue to fall, while the data used to estimate the equations came from the era with higher restrictions. On the other hand, they do not include a period of financial crises such as several Asian economies are now having.

We conducted the projections under two scenarios:

1. Exponential function of the share of consumer-ready products in total global agri-food exports.
2. Linear function of the share of consumer-ready products in total global agri-food exports.

The equations describing these two scenarios, estimated from historical trade data for the specified period, are presented below.

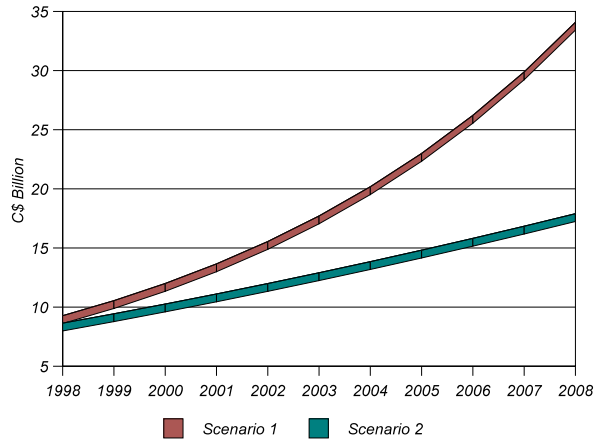
$$Y = 9.6x10^{-28}\exp^{0.03065t}$$
$$V_t = 5.5x10^{-88}\exp^{0.10214t} \quad \textbf{(1)}$$

$$Y = -19.55 + 0.00997t$$
$$V_t = -2033.6 + 1.47t \quad \textbf{(2)}$$

where t is time, V_t is total agri-food exports and Y is the proportion of consumer-ready products in total agri-food exports.

The proportion of Canada's consumer-ready exports in the total value of global agri-food exports ranged from 29.08% in 1989 to 37.94% in 1997, growing at an average rate of 3.65% per annum. The results of the projections are presented in Figure 2.8.

Figure 2.9: Forecast of Total Consumer-Ready Exports by Canada's Agri-Food Sector (1998-2008)



With the first scenario, Canada's total agri-food exports increase from $23.5 billion in 1998 to $65.4 billion in 2008. The proportion of consumer-ready products in Canada's total agri-food exports is forecast to increase from 38% to 52% in 2008. Total consumer-ready exports increase from about $9 billion in 1998 to $34 billion in 2008.

Under Scenario 2, total agri-food exports increase from $22 billion to $36.8 billion in 2008. Consumer-ready products rise from $8.3 billion to $17.5 billion, about 46% of the total.

Our expectation is that changing trade barriers would lead to an increase in the exports of consumer-ready products at a faster rate than we

have projected here. This expectation is based on the poor predictive power of the past on the future. The move away from bulk commodity exports implies a change in relationships along the supply chain, a change in the quantity, quality and skills of the sector's human resources, and significant new investment in value-added activities. These create their own dynamics for the sector in terms of human, capital, organizational and physical resource needs. It leads to thinking about what to produce - and how - as well as where to market such products at the highest return. It requires industry stakeholders to think about their supply chains and assess how they can leverage their inimitable resources to sustain their competitiveness over the long run.

Where to market products is a function of market access rules, and these may be influenced by the Next Round of WTO negotiations. The trends presented in Figures 2.6 and 2.7 illustrate the effect of tariff escalation on the export opportunities for consumer-ready products. In the US, where almost all tariffs had been declining towards zero since 1989, the value and volume of Canada's exports of consumer-ready products have been increasing at a relatively faster rate than observed for exports to the rest of the world where tariffs have been relatively high. The Canadian Agri-Food Marketing Council has indicated that to enhance Canada's share of the global agri-food market, the focus should be on consumer-ready and high value-added products.

What and where to market is also a function of the ingenuity of agri-food stakeholders. For example, most industry studies on the outcome of the Canada-US Free Trade Agreement indicated that the processing tomato industry of Ontario and the table wine industries of Ontario and British Columbia would not be competitive against their California counterparts based on historical data (George Morris Centre, 1992). However, the post mortem of performance in these industries indicate upward trending net exports in these products. To achieve these results, industry stakeholders undertook significant changes in their business structures, inputs, and business relationships. Industry leaders believe that increasing trade liberalization could lead to similar results in other industries. The Next Round of WTO trade negotiations, then, presents an opportunity for Canada's agri-food industries to not only increase their market share of global trade as they have done with the US under the FTA, but to enhance their global exports of high value-added consumer-ready products.

3.1 Canada's Agri-Food Industries and Market Access Orientation

Our objective in this section is to assess the relative proportions of the supply-managed and non-supply-managed segments in Canada's agri-food sector. This is important from the overall objective of this research – assessing the net benefits of trade liberalization to the various industries in Canada's agri-food sector. There are two major components to the section: (1) Quantifying the proportion of Canada's total agri-food revenues that emanate from non-supply-managed industries; and (2) Quantifying the proportion of Canada's agri-food revenues that emanate from supply-managed industries.

It is realized that many approaches may be used to quantify the relative proportions of these two segments, therefore the next section presents a methodological overview of the approach used in this study to achieve the objective. Additionally, we present a brief review of the trade barriers confronting the non-supply-managed industries and those protecting the supply-managed industries.

3.2 Methodological Overview

Statistics Canada uses Gross Domestic Product (GDP) to measure the unduplicated value of production arising within the boundaries of Canada. To avoid double counting in the derivation of GDP, Statistics Canada uses the concept of *value added* or net output. This concept involves subtracting intermediate inputs from the gross output for each industry. Hence, GDP is the sum of all industries' value-added. Since all agri-food industries utilize physical inputs which have otherwise been produced by other industries, the concept of value added is most applicable in calculating an industry's contribution to total GDP. Table 3.1 defines the concepts for the production and processing segments of agri-food industries. Throughout this section, the use of these concepts will be based on the definitions presented here.

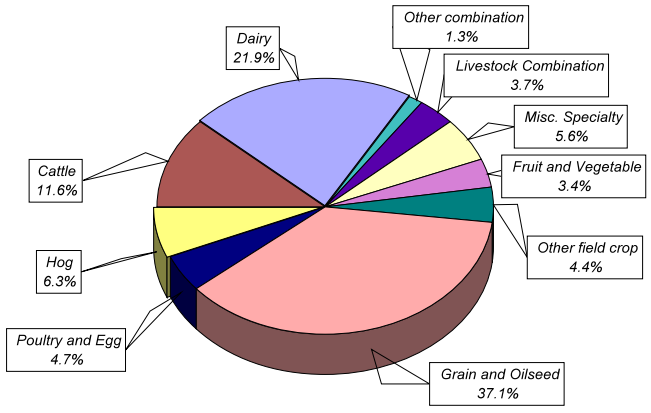
Table 3.1: Definition of Value Added At Production and Processing Levels

Variable	Primary Production	Processing
Value added	Gross Output - Intermediate Inputs	Gross Output - Intermediate Inputs
Gross output	Cash receipts + Income In-kind + Inventory Change + Government Payment + Farm Rent Income	Value of Shipments + Value of Physical Change in Inventories + Non-manufacturing Revenues
Intermediate inputs	Farm Operating Expenses	Material Inputs + Service Inputs
Farm Operating Expenses	Seed + Fertilizer + Pesticides + Feed + Electricity & Fuel + Rent + Insurance + Property Taxes	

3.3 Distribution of Agri-Food GDP

We evaluate the relative proportion of the various agricultural industries using the 1996 Census figures (Statistics Canada). Total net farm income (1995) was about $5.75 billion (Statistics Canada, 1996). The distribution of this among the principal agricultural industries is presented in Figure 3.1. With about 37% of total net farm income, the figure shows that the grain and oilseed farms are the single largest contributors to total Canadian net farm income. The second largest share of 22% was for the dairy farms. The cattle and hog industries accounted for 11.6% and 6.3% of total agricultural net farm income respectively. Specialty crops accounted for about 5.6% of total farm income compared to 4.7% for the poultry and egg industry.[1]

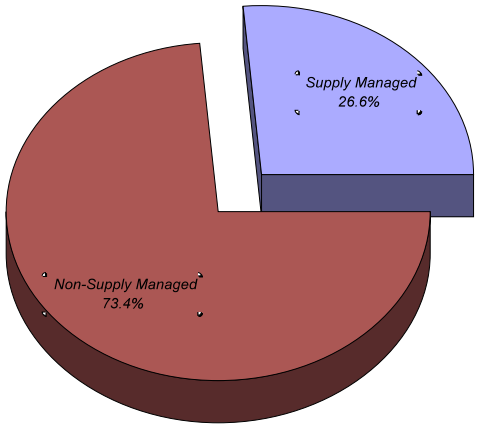
Figure 3.1: Net Farm Income (Value-Added) by Individual Agricultural Production Industries



Source: 1996 Census, Statistics Canada

Since the section aims at quantifying the relative size of supply-managed and non-supply-managed industries, we structured the above distribution of net farm income into the two industry groups. The supply-managed encompassed dairy, poultry and eggs industries from Figure 3.1. Figure 3.2 shows that the non-supply-managed group accounted for almost 74% of total net farm income in Canada for Census 1996.

Figure 3.2: Total Net Farm Income (Value Added) By Industry Groups (1995)

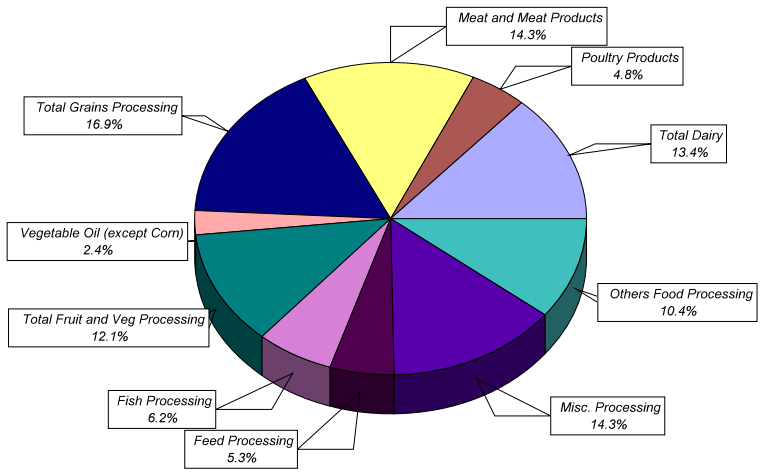


Source: 1996 Census, Statistics Canada

Turning our attention to the food processing segment, we assess the distribution of value added manufacturing between the various agri-food processing industries. Figure 3.3 presents the distribution of the 1995 total manufacturing value-added of $14.721 billion

[1] It is important to note that Figure 3.1 includes government support payments to the industries as well as income from farm rent. We discuss the proportion of government support payments to agriculture in Section 4.

Figure 3.3: Total Food Industries Manufacturing Value-Added By Industries

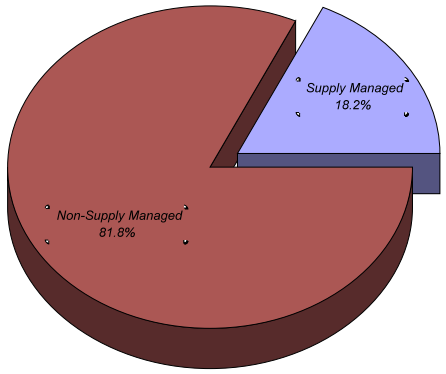


Source: CANSIM, Statistics Canada

among the respective industries.[2] The figure shows that grain processing was, as in the case of primary production, the largest contributor to total food processing value-added, followed by meat and meat products. Fruit and vegetable processing accounted for about 12% while dairy processing was about 13.4%. Miscellaneous processing, encompassing sugar, potato chips, pretzels, and malt flour, accounted for about 14% of total manufacturing value-added.

The distribution of food processing manufacturing value-added between the supply-managed and the non-supply-managed industries is presented in Figure 3.4. It shows that the former accounted for 18.2% compared to 81.8% for the non-supply-managed industries. This distribution is not a real surprise since the supply-managed industries are, technically speaking, limited in their expansionary initiatives by the domestic demand for their products. This contrasts with the non-supply-managed industries that are able to respond to external demand conditions and have therefore ridden the wave of expanding global merchandise trade.

Figure 3.4: Distribution of Food Processing Value-Added By Group



Source: CANSIM, Statistics Canada

3.4 Barriers to Trade

In this section, we review the major agri-food trade barriers for the two industry groups under consideration. Typically, the non-supply-managed industries are confronted with foreign government policies that constrain their access to international markets while the supply-managed industries are confronted with domestic government policies that protect them from international competition.

[2] Although 1996 data were available for most processing industries, we used the 1995 data for consistency with the farm level data.

3.4.1 Barriers Confronting Non-Supply-Managed Industries

We classify the barriers confronting Canada's non-supply-managed industries into three major groups:

- Tariffs
- Non-tariff barriers and sanitary and phytosanitary measures
- Export and domestic subsidies

Tariffs: The Uruguay Round converted all quantitative restrictions to trade into more transparent tariffs. However, the Agreement also allowed member countries to establish the initial tariffs at levels that provided their protected industries with the same level of protection as the non-tariff barriers the tariffs replaced. Hence, most tariffs established under the Uruguay Round of GATT were quite high. The Agreement stipulated reductions in these tariffs over time, a minimum of 15% for each tariff item and an average across all commodities of 36% over the phase-in period. Given that most countries submitted their tariff reductions schedules with this condition in mind, tariffs still pose significant barriers to Canada's non-supply-managed industries.

Most countries developed tariff schedules that protected their high value-added or consumer-ready industries. For example, Japan's tariffs on canola oil are much higher than their tariffs on canola. Thus, significant tariff barriers exist for high value-added products into most markets, *forcing* the non-supply-managed industries to export bulk commodity or intermediate products. This limits the potential contribution of these industries to the total agri-food GDP. The evidence of the effect of higher tariffs on consumer-ready products exports is revealed in comparing trade in consumer-ready products with the US to that with the rest of the world. Thus, the grain and oilseed industry is restricted in its ability to effectively compete in some of the major markets due to tariff barriers as are the red meat and confectionery industries. In addition to these tariffs, tariff rate quotas are used to control market access opportunities in many countries.

The "good news" is that these tariffs are all scheduled to decline. There is some uncertainty about how fast they will decline in the Next Round of WTO Negotiations. Yet, the certainty of their decline over time is no longer arguable. Therefore, by focussing on increasing their efficiencies, Canada's non-supply-managed industries may be able to successfully take advantage of declining tariffs in international markets.

Non-tariff barriers and sanitary and phytosanitary measures: As tariffs decrease, non-tariff barriers become increasingly attractive in protecting domestic markets. However, since the WTO does not allow the application of these non-tariff barriers, many countries are seeking rather innovative approaches to imposing them. In most cases, they are imposed for human or animal health or environmental protection reasons, making them sanitary and phytosanitary measures, measures that are *technically* allowed by the WTO. For example, the EU imposed a ban on Canadian and US beef because hormones are used in cattle production. The reason cited was public health protection. Despite the fact that the WTO Dispute Settlement Body and the Appellate Body both ruled in favour of the complainants, the fact remains that the ban poses significant opportunity costs on the Canadian beef industry.

Lack of clarity, transparency and certainty of standards and regulations are another set of non-tariff barriers that confront Canadian agri-food industries in the international trade environment. This is often the case in the emerging economies or economies in transition. China, for example, is identified as a major culprit in the area of transparency and certainty of standards and other regulations. This imposes significant costs on Canadian exporters to China who often exceed the standards to avoid potential problems at the entry point.

Industry stakeholders observe that these non-tariff trade barriers are going to be important in the coming years even as tariff trade barriers lose their significance. Therefore, there is a general belief among industry stakeholders who participated in focus group interviews that particular emphasis is placed on non-tariff barriers in the Next Round of WTO Negotiations.

Export and Domestic Subsidies: The US EEP and the EU's CAP are the principal examples of export and domestic subsidies that affect Canada's non-supply-managed industries. The EEP was established in 1985 to boost exports by giving cash incentives to companies that succeeded at winning export contracts. It allowed the US to enhance its competitive position against the EU's CAP, which had been increasing support for EU farmers and allowing them to be price competitive in third countries.

Canada and other grain and oilseed exporting countries became victims of the US-EU subsidy war. Although the US agreed under the FTA not to use the EEP against Canada in third countries, this agreement has failed whenever the EU has been a threat. For example, the EEP has been employed in wheat sales to North African countries, resulting in loss of markets for Canada. These subsidies are scheduled under the Uruguay Round to decrease in both value and volume. Therefore, over time their impact on Canada's agri-food non-supply-managed industries is expected to decline. However, it does not seem the fall in these domestic and export subsidies is going to proceed at a rapid enough rate to reduce their negative influence on third countries such as Canada. For example, under Agenda 2000, the EU has planned reductions in market support prices and an increase in direct payments. The expectation is to enhance the competitiveness of EU agriculture, encourage European farmers to be more responsive to market signals, while reducing compensation on over production. However, as noted by Simon Taylor, in *The European Union in 1999*, "even after the Agenda 2000 reforms, [agricultural expenditures] will account for almost 50% of the EU's total budgetary expenditure of more than 100 billion ecus [$160 billion]." As an illustration, the intervention price for cereals will be reduced in a single step by 20% in 2000 while direct payments will be increased from 54 ECU/tonne to 66 ECU/tonne. What are the implications of such large subsidies flowing into agriculture on the competitiveness of Canadian agri-food exports in third countries?

There is the possibility that as a result of the cosmetic Common Agricultural Policy reforms, the US Export Enhancement Program will continue to be used to "help products produced by US farmers meet competition from subsidizing countries, especially the European Union" (USDA, 1997). Commodities eligible under EEP initiatives are wheat, wheat flour, semolina, rice, frozen poultry, frozen pork, barley, barley malt, table eggs, and vegetable oil, most of which are exported by Canada's agri-food industries. Thus, in the absence of the imposition of significant discipline in the area of domestic and export subsidies in the Next Round, the classic consequence of the grass suffering as a result of the fight

between two elephants continues.

3.4.2 Instruments Protecting Supply-Managed Industries

Three major instruments are used in protecting Canada's supply-managed industries: (1) Tariffs; (2) Production regulations; and (3) Marketing regulations. Canada's tariff schedules for its supply-managed industries presented in December 1993 at the conclusion of the Uruguay Round of GATT are presented in Table 3.2. The table shows that the tariffs on processed products are relatively higher than for raw products, even though in the Canadian case, the difference is almost insignificant. For example, the tariff on butter was almost 24% higher than the tariff on milk.[3] The literature indicates that the rates of reduction of these tariffs and the established bound rates are going to be critical subjects of negotiation in the Next Round.

Table 3.2:Canada's Tariff Equivalents in 1995 and 2000 Presented in December 1993

	1995		2000	
Product	**Tariff Equivalent (%)**	**Specific Tariff**	**Tariff Equivalent (%)**	**Specific Rate**
Milk	283.8	$40.60/hl	241.2	$34.51/hl
Cheese	289.0	$4.15/kg	245.7	$3.53/kg
Butter	351.4	$4.71/kg	298.7	$4.00/kg
Skim Milk Powder	237.2	$2.36/kg	201.6	$2.01/kg
Chicken	280.4	$1.96/kg	238.3	$1.67/kg
Turkey	182.1	$2.30/kg	154.8	$1.95/kg
Eggs	192.3	$0.94/dozen	163.5	$0.80/dozen
Hatching Eggs	280.4	$3.43/dozen	238.3	$2.91/dozen

Production and Marketing Regulations: Canada's supply management policy operated under Article XI (ii) c of the GATT, which allowed the use of quantitative restrictions on imports as long as domestic production was controlled. Hence, the production of milk and poultry products are controlled in Canada under a quota system which attempts to match domestic requirements of these products to production. These production regulations ensured people acquired the right to produce in these industries through the acquisition of quotas. Since the quota is *relatively* fixed, people who want to enter the industry or expand their production need to find people who want to exit the industry to purchase their quota. The production regulations ensure that producers do not over-produce, thereby weakening the supply management program.

The supply-managed industries also have marketing regulations to ensure that the appropriate price is

[3] These tariffs are not unique to Canada's supply-managed industries. For example, durum wheat had a tariff equivalent of 58% and beef and veal 31% presented in 1993.

maintained in the industries. For example, the dairy industry establishes prices once a year, adjusting it once it is found to be necessary while the poultry industry generally establishes prices once every quarter. These marketing regulations are also aimed at ensuring orderly marketing of the raw products. These production and marketing regulations are coming under increasing pressure as tariffs decline. What policies should be developed, if any, to ensure the continued competitiveness of the supply-managed industries in an increasingly liberalized trade milieu? The answer to this question gets complicated when placed within the context of the international trade negotiations when competing interests come under scrutiny even as trade partners seek to trade market access.

4.1 Government Support for Agriculture

In this section, we present the analysis of government support to agriculture in Canada. We employ the government transfers' approach which focuses on transfers made to agricultural producers from the full range of agricultural programs and policies, including regulations. The approach encompasses measuring all direct, indirect and regulatory transfers which affect producer incomes. The data used in this section, unless otherwise specified, were obtained from Agriculture and Agri-Food Canada.[5]

Direct transfers include direct non-regulatory payments or foregone revenues provided directly to producers. Indirect transfers, on the other hand, include non-regulatory programs in which government transfers are provided to agriculture as a whole but not directly to producers.[6] Regulatory transfers are revenues received by producers as a result of regulations that influence prices in the marketplace. The government transfers' approach does not include food aid expenditures and grants to the food processing sector and considers neither the direct and indirect impacts of foreign policies on producer returns nor the spillover effects across provinces.

In general, government support in Canada has been shifting from market price support to direct payments. The literature and our ensuing analysis indicate that the level of direct payments has been decreasing over the past few years. This decreasing trend emanates from changes that have been implemented in the crop insurance premium sharing structure in Western Canada, as well as the termination of Gross Revenue Insurance Plan (GRIP) in 1996 and the National Tripartite Stabilization Plan (NTSP). The termination of the Western Grain Transportation Payments in 1995 was an important contributor to the sharp reduction in direct payments. A detailed description of government transfers by provinces is presented in the ensuing subsections, looking at the trends in expenditures by the type of transfer.

4.2 Government Transfers to Agriculture

Government transfers to agriculture data shows a significant shift from an upward trend in the pre 1990 era to a downward trend in the post-1990 era. As a result of this shift, we conduct the analysis of government transfers for the post 1990 era, to capture the extent of the changes in government direct, indirect and regulatory transfers to agriculture in the various provinces. We first look at total government transfers and how they are distributed among the transfer types over the period. We then present the results of the analysis for each of the transfer types by provinces.

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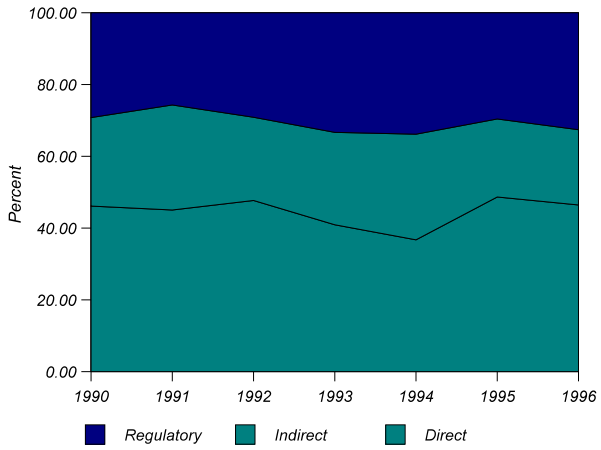
[5] We acknowledge the help of Troy Hennigar, Government Transfers, Policy Branch, AAFC, Ottawa for providing the electronic version of the data used in this section.

[6] The direct transfers correspond to the dollar amount paid by government less administration costs, fees or contributions paid by producers.

4.2.1 Total Government Transfers

Total government transfers to agriculture declined at an average rate of 6.3% per annum between 1990 and 1996, dropping from $8.1 billion in 1991 to about $4 billion in 1996. Its components – direct, indirect and regulatory transfers all decreased over the period too. For example, direct transfers decreased from about $3.6 billion in 1991 to $1.85 billion in 1996. Similarly, indirect transfers decreased at an average annual rate of 6.2 %, from $2.4 billion to $837 million between 1991 and 1996. Regulatory transfers decreased from about $2 billion in 1991 to about $1.3 billion in 1996. These decreases are as a result of shifts in government policies and they lead to a redistribution of the sources of transfers to agriculture.

Figure 4.1: Distribution of Total Government Transfers By Type



Source: AAFC

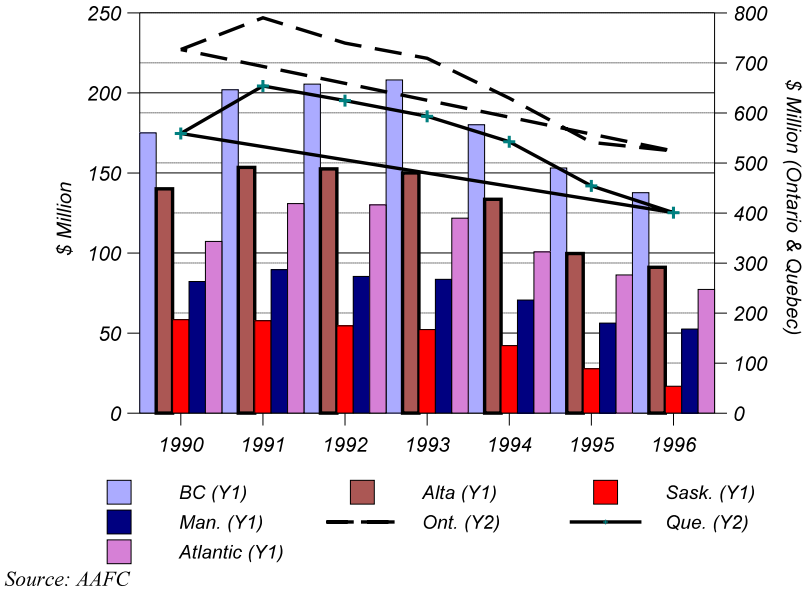
Figure 4.1 shows the shifts, albeit slight, in the contribution of the types of transfers to total government transfers. Direct transfers component of total government transfers increased at an average annual rate of 1.2% while regulatory transfers component increased at about 2.5% per annum between 1990 and 1996. Indirect transfers contribution to total government transfers decreased about 30% in 1991 to about 21% in 1996. By 1996, direct transfers was still the largest type of government transfers to agriculture at 46.5%, compared to 45% in 1991. On the other hand, regulatory transfers had overtaken indirect transfers over the period to contribute about 33% of total transfers to agriculture in 1996 compared to 26% in 1991.

Total transfers in Alberta declined from $1.6 billion in 1991 to $773 million in 1996, an average annual rate of reduction of about 6.7%. This was the second highest average annual rate of decline after Ontario's 7.9%. Saskatchewan, with the highest total transfers in 1991, was the third highest by 1996. The data shows that total government transfers in Ontario in1990 were the highest, about $1.4 billion (21.9% of total) and by 1996, total transfers in Quebec were the highest, about $893 million (22..4% of total). In total, the western provinces (B.C., Alberta, Saskatchewan and Manitoba) accounted for about 55% of total government transfers between 1990 and 1996.

4.2.2 Regulatory Transfers

Figure 4.2 shows the distribution of total regulatory transfers among the provinces. The figure shows Ontario and Quebec together accounting for almost 70% of total regulatory transfers. This large proportion of total regulatory transfers in Ontario and Quebec may be explained by the relative size of their supply-managed industries and their relative populations (market sizes).

Figure 4.2: Total Regulatory Transfers by Province

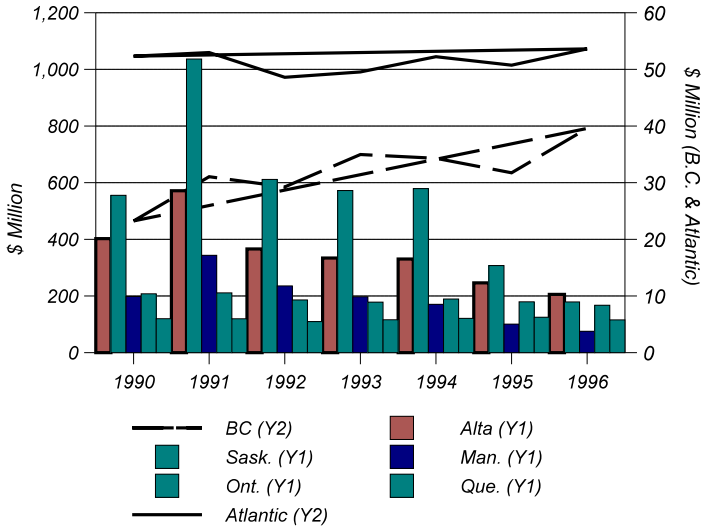


Source: AAFC

Total regulatory transfers in Canada declined steadily between 1990 and 1996, from about $2 billion in 1991 to $1.3 billion. Regulatory transfers in Ontario and Quebec (represented on the right Y-axis (Y2)) in 1990 were respectively $726 million and $559 million compared to $140 million in Alberta, $170 million in B.C., $82 million in Manitoba and $58 million in Saskatchewan. By 1996, Ontario and Quebec's regulatory transfers were respectively $524 million and $401 million compared to $91 million in Alberta, $138 million in B.C., $53 million in Manitoba and $16 million in Saskatchewan. The average annual rate of reduction in regulatory transfers was highest in Saskatchewan (17.3%). Together, regulatory transfers in the western provinces decreased from 25% to 22% of total regulatory transfers between 1990 and 1996.

4.2.3 Indirect Transfers

Figure 4.3: Total Indirect Transfers By Province



Source: AAFC

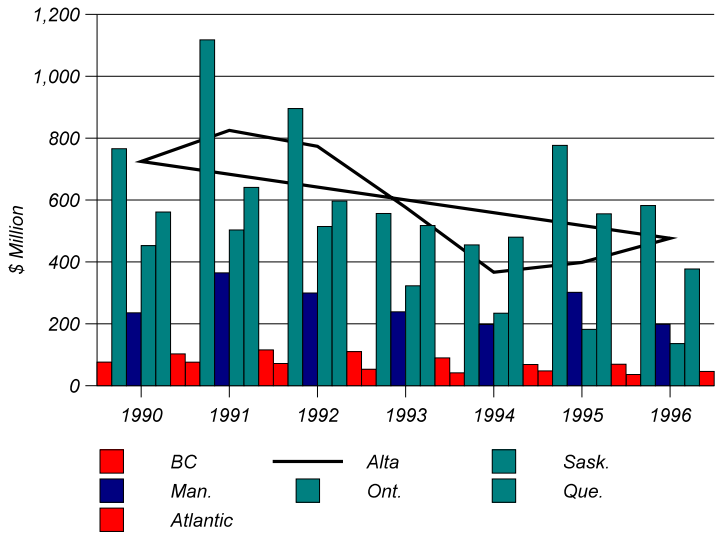
Total indirect transfers to agriculture in Canada decreased from $1.6 billion to $837 million between 1990 and 1996, an average annual rate of decline of 6.2%. Figure 4.3 illustrate the indirect transfers by province. It shows that Saskatchewan, with about $556 million in 1990, had the highest indirect transfers. This was equivalent to about 35% of total indirect transfers in that year. Saskatchewan's share declined to 21% by 1996. On the contrary, the Atlantic provinces and B.C (Y-axis on the right) respectively increased their indirect transfers between 1990 and 1996 from $52 million and $23 million to $54 million and $40 million. As a result of these

increases, Atlantic Canada's share of total indirect transfers almost doubled from 3.4% to 6.4% while B.C.'s more than tripled from 1.5% to 4.7% between 1990 and 1996. Ontario's share increased from 13% to 20% with a decrease in transfers from $208 million in 1990 to $167 million in 1996 while Alberta's decreased from $403 million in 1990 to about $206 million in 1996 without any significant change in its share of total indirect transfers in Canada – from 26% to 24.6%. Manitoba's transfers decreased from $344 million in 1991 to about $75 million in 1996.

4.2.4 Direct Transfers

Total direct transfers to agriculture decreased from $2.9 billion to $1.85 billion, at an average annual rate of decline of about 4.9% between 1990 and 1996. Figure 4.4 illustrate the direct transfers by province.

Figure 4.4: Total Direct Transfers to Agriculture By Province



Source: AAFC

Direct transfers in Alberta declined from $725 million in 1990 to about $476 million in 1996 while Ontario's decreased from about $453 million to $136 million in the same time frame. Direct transfers in Manitoba, Saskatchewan and B.C. declined respectively from $236 million, $766 million and $76 million in 1990 to $199 million, $582 million and $36 million in 1996. Direct transfers increased in all provinces with the exception of B.C. between 1990 and 1991.

Saskatchewan and Alberta had the largest direct transfers to agriculture. Together, they accounted for 51% of total direct transfers in 1990 and 57% in 1996. This increase may be a result of the termination of Western Grain Transportation subsidy and the direct payout made to the prairie provinces between 1995 and 1997. This rationale is supported by the fact that the proportion of total direct transfers accounted for by Alberta and Saskatchewan increased by about 13% between 1994 and 1996.

5.1 Trade Liberalization Effects on Canada's Agri-Food Industries

We present the underlying assumptions and the modelling approach used in quantifying the effects of liberalizing international trade on Canada's agri-food industries in this section. In addition, we present the principal scenarios that were evaluated. These assumptions influence the results presented in Section 6. We also present the key tariff and non-tariff barriers that confront the agri-food trade as a background to estimating the implications of the removal of tariffs and the potential emergence of specific non-tariff barriers on net benefit of Canada's agri-food industries.

5.2 Tariff and Non-Tariff Barriers Confronting Agricultural Trade

There are principally two types of trade protection instruments: Tariffs and Non-Tariff Barriers (NTBs). This section presents and reviews these two instruments with the view to showing the declining importance of tariffs in the total scheme of global trade. Since export and domestic subsidies are not tariffs and have the potential of having some of the same effects on competing nations as non-tariff barriers, we define non-tariff instruments broader than they are traditionally defined to cover them, as well as technical barriers to trade, sanitary and phytosanitary measures and export documentation. Tariffs, on the other hand, are defined as presented by Bredahl et al. (1989) and Hoeller et al. (1998). We discuss the transparency of these instruments and the limitations they have on global trade. The section evaluates the tariff and non-tariff barriers in the major regions that can have significant effect on Canada's agri-food trade performance.

5.2.1 Tariff Barriers Under the Uruguay Round

Hoeller et al. (1998) evaluated the current trade regime, comparing the trade policy indicators in the *Quad* countries.[7] They discovered that the increase in tariff bindings implies that the use of tariffs as a discriminatory instrument has declined significantly. It is important to note, though, that the trends towards reductions in tariffs are not interpreted to mean a triviality of tariffs in trade, especially agri-food trade. This comes from the increasing number of regional trade blocs that are increasing their bindings on tariffs or generally eliminating tariffs all together. For example, under NAFTA, there was a five to ten-year phase out of all tariffs, with fifteen years in certain sensitive industries.[8] The European Union has been operating an intra-EU free trade (both tariffs and quantitative restrictions) since 1992.[9]

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[7] The Quad encompasses Canada, the US, the EU and Japan.

[8] The NAFTA stipulated free trade in agricultural products within fifteen years from 1994. This excludes Canada's supply-managed industries of poultry and dairy.

[9] However, there are still sectors within the EU that are not freely traded, e.g., energy, telecommunications and transportation. These are undergoing liberalization at varying rates as are other services such as postal, legal and leasing services.

There are at least three types of tariffs under the Uruguay Round: (1) Most Favoured Nation (MFN) Tariff; (2) Tariff-Rate Quota (TRQ); and (3) Preferential Treatment Tariff. The MFN tariff is the tariff established and applied to all member countries. It is the standard tariff level, and no member country can be subjected to any tariff above the MFN tariff. The preferential treatment tariff is a bilateral or multilateral negotiated tariff schedule that is lower than the MFN tariffs. Examples of these tariffs are those among members of trading and/or economic blocs such as the EU-15 member-countries, Canada and the US under the Canada-US Trade Agreement and those between Canada, US and Mexico under NAFTA, Association of South East Asia Nations (ASEAN)[10], and MERCOSUR, the trade agreement among the South American countries of Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay. Preferential treatment tariffs also cover the relationships between the EU and the African-Caribbean-Pacific countries in the Lomè Convention. Market access conditions under the Uruguay Round Agreement required that countries open their markets to a minimum of 3%, increasing to 5% over the phase-in period of the Agreement, of their domestic consumption in the base year to imports. Imports falling into this minimum access are assessed zero or very low tariffs compared to those outside it. The tariff applied to imports falling within the minimum access requirements is referred to as tariff-rate quota. Imports outside the minimum access requirements are assessed scheduled MFN tariffs.

There are at least two aspects of tariffs under the Uruguay Round that cause some disconcerting effects in international trade. First, the tariffication of all non-tariff quantitative barriers resulted in some very high and exorbitant tariffs. The average tariff reduction rule for agricultural products under the Uruguay Round has led to a concentration of tariff reduction in less-sensitive categories, where tariffs were already generally low, while minimizing reductions in areas which are considered sensitive. In the case of Canada, the tariffication resulted in prohibitively high tariffs on poultry and dairy products. The other Quad members had similar prohibitive tariffs on dairy, sugar, fruits and vegetable products. However, the average import-weighted tariff was highest in the EU at 6.6%, followed by Canada at 5.7% and the US and Japan at 3.7% and 3.5% respectively. The second disconcerting effect of the way tariffs were applied under the Uruguay Round is that tariff escalation was permitted, i.e., countries applied tariffs according to the degree of value-adding that the product had undergone. This led to an increase in the average tariff in certain regions when the Agreement came into force. For example, the EU's simple average applied tariff increased from 7.6% in 1993 to 9.5% in 1996.

The principal tariffs are those influencing hitherto quantitatively-protected industries such as dairy in all Quad countries, and poultry in Canada, sugar in Japan, the US and the EU and beef in the EU. With the exception of these tariffs, there were some low tariffs applied by Canada on beef, durum wheat and barley, for example. It is important to note that the tariffs that are considered "important" or "critical" are all subjected to the minimum reduction rate of 3% per annum or 15% over the phase-in period of the Agreement while the relatively "unimportant" tariffs are subjected to the 6% per annum or 36% reduction over the phase-in period of the Uruguay Round. So, the *major* tariffs have two principal differentiating characteristics: they are much higher and they come down much more slowly than the *minor* tariffs. From this perspective, what we observe is that the principal agri-food markets were all

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[10] ASEAN comprises Brunei Darussalam, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Cambodia holds observer status.

attempting to protect very similar industries that they consider very sensitive with very high tariffs that are reduced at half the rate of reduction for the others.

5.2.2 Non-Tariff Barriers Under the Uruguay Round

As successive GATT negotiations gradually reduced tariff levels around the world, non-tariff barriers (NTBs) steadily became more visible, to the extent that non-tariff barriers now represent the most important barrier to freer trade. Through a process of tariffication, GATT and now the WTO seeks to convert non-tariff barriers to tariff equivalents and negotiate the gradual reduction of these tariffs. Providing a comprehensive list of all non-tariff barriers is next to impossible since they take a myriad of forms and their creation is only constrained by the inventiveness of bureaucrats. However, what follows is a discussion of the main NTBs affecting agricultural products.

A. Import Quotas

Import quotas impose a physical limit on the quantity of a good which an importer allows into the country. Historically, they have been the major trade-restricting policy alternative to tariffs (Kerr and Perdikis, 1995). Import quotas can often violate the GATT principle of non-discrimination, therefore, are more distortionary trade barrier than tariffs. This is because allocation of import quotas among competing exporting countries invariably becomes a highly politicized process and may bear no relationship to the relative competitiveness of the potential exporters. Import quotas create rents in the importing country since importing firms can purchase the imported product at a low international price and sell it at the higher domestic price. Often the government in the importing country will administer the quota system by allocating import licences among importing firms to ensure that quota limits are not exceeded. Clearly, the rents available to importing firms create a vested interest in the maintenance of the import quota system. Under the WTO agreements, import quotas have been converted to tariffs and tariff quotas. Under the Uruguay Round Agreement, however, countries may be required to provide guaranteed levels of access to agricultural products - this is similar in effect to an import quota (Kerr and Perdikis, 1995).

Tariff quotas have become a common tool for restricting trade. This means that, beyond the minimum levels of market access, importing countries apply a tariff to a certain volume of imports, with higher tariff levels kicking in as import volumes increase beyond pre-determined levels. For the US market, above-quota tariffs remain high and tariff quotas are not always filled, this was particularly the case for dairy products in 1996. In the 1996-97 marketing year in the EU, tariff quotas for products such as durum wheat, cheddar cheese, poultry eggs for consumption, pork, beef and veal were under-filled (OECD, 1998). Canada met its Uruguay Round commitments for tariff-quotas in all products except cream, durum wheat and barley during the 1996/97 marketing year. Imports were 80% of quota for cream, 74% for durum wheat and 32% for barley. Furthermore, in September 1997, Canada suspended the application of its tariff-rate quota for barley and barley products imported from the US but has the option to reinstate it in the future. Failure to meet tariff quota levels is a concern because it may reflect continued bureaucratic impediments in the administration of the tariff quota system, for example in the

allocation of import licences. Future negotiations will focus both on increasing access levels and reducing the tariff levels attached to tariff quotas.

B. Variable Levies

A variable levy is a tax on imported goods but, unlike a tariff, is not pre-set at a fixed level. The purpose of a variable levy is to protect domestic prices from fluctuations in the world price by establishing a domestic support price. As world prices fall, the size of the levy increases proportionately to equilibrate the difference between the world price and the domestic support price, and vice versa. The prime user of variable levies in the agricultural sector was the EU. Under the Uruguay Round Agreement, the EU agreed to convert its variable levies into import tariffs. Latin American countries use a "price band system" - essentially a more sophisticated version of the variable levy which bases the reference price on a moving average of world prices plus a fixed margin and which sets a floor and ceiling on the amount of the duty. Although variable levies are in principle banned under the WTO Agreement on Agriculture, according to Laird (1997), this is being interpreted as meaning that the duty must not exceed bound levels. Bound tariffs are a basic GATT principle whereby member states agree that once a tariff level is determined it cannot be raised, i.e., *it is bound at that level*. Countries can set high bound levels and then allow their tariffs to vary below the bound level, effectively having a variable levy. This was not the intent of the GATT agreement. Variable levies pass all the risk of international market fluctuations onto the exporter.

C. Health, Sanitary and Phytosanitary Regulations

Non-tariff barriers of this nature are growing in importance and are governed by the Sanitary, Phytosanitary (SPS) Agreement. Increasing consumer concerns about food safety, particularly in Europe in the wake of the Bovine Spongiform Encephalopathy (BSE) crisis have led to a tightening of health and SPS regulations for food products. The creation of new government agencies and the adoption of new food safety regulations in several countries (e.g., the UK, the USA, Canada, Japan) reflects the seriousness placed on ensuring a safe food supply. Clearly, an important aspect of this is ensuring that the sanitary and phytosanitary standards of imported food products are at least as high as those for domestically produced food. This means that exporters must conform to importing countries' regulations. Clearly this can be costly, particularly if an exporter faces different standards in different export markets.

From an international trade perspective, health and SPS regulations have the potential to become a quagmire of trade restricting measures. The problem is that in many cases, the regulations are based on legitimate domestic consumer concerns but the potential for abuse of these concerns through the capricious use of regulations to restrict trade is substantial. In some cases, the regulations represent unintentional barriers to trade - the prime intention being to protect consumers or to respond to apparent consumer concerns. When different countries impose different standards, the costs to an exporter of satisfying a multitude of regulations can be substantial. In some cases it may be impossible for an exporter to satisfy more than one importer's regulatory framework in the same production facility, leading to the development of dedicated exporting facilities. Clearly this is not only costly but

introduces a high degree of asset specificity on the part of the exporter who now has production facilities locked into one market; the possibility for appropriation of rents through opportunistic behaviour on the part of the importer becomes a concern.

Negotiations for equivalence or harmonization of standards between trading partners are an essential defence to the growth of SPS non-tariff barriers to trade. Currently, the SPS requires that all sanitary and phytosanitary import regulations must have a scientific basis. This has become a contentious trade issue because in some cases there is no agreement on what constitutes *appropriate science*. Further, consumers in some countries may simply prefer that some products not be sold in their markets whether or not a scientific basis exists for their exclusion. For example, the EU has recently asked that the SPS be renegotiated to add *consumer preference* to the list of reasons why SPS import restrictions can be put in place. This stems from consumers' concerns regarding genetically modified foods and organisms.

D. Technical Barriers to Trade

Consumer protection legislation (often in the form of "technical" regulations, for example affecting packaging and labelling) can become a barrier to trade because nations develop their standards and procedures independently (Kerr and Perdikis, 1995). Again, often the barriers are unintentional consequences of a policy to protect consumers. Exporters face higher costs if they must comply with multiple standards. Clearly, as with the SPS regulations, consumer protection legislation can be used strategically to limit imports.

Canada can expect to face technical barriers to trade in most of its major export markets for agricultural products, in particular the EU. In a recent review, the WTO found that US technical regulations were "generally based on international norms and privately developed standards" (WTO, 1996). Yet, environmentally-motivated process standards enforced at the border existed, e.g., "dolphin-friendly" tuna fishing methods. The recent proposal to the US Senate requiring compulsory labelling of country of origin on all beef imports is another example of the apparent ease with which technical barriers to trade can be erected. The Canadian beef industry regarded this as a barrier to trade because it would increase costs for US processors importing Canadian beef if they were required to process Canadian beef separately and/or install in-plant traceability systems to ensure accurate product labelling.

For the crop sectors in particular, apparent consumer resistance in Europe to the use of genetically modified organisms (GMOs) represent a potential new trade barrier. For example, France recently announced a suspension on the distribution of genetically modified corn seed while the French Council of State evaluates a request from the Green Peace organization to remove all genetically modified seeds from the marketplace. Earlier France had submitted a request to the EU for the approval of two strains of GMO corn for use in EU agriculture, only to withdraw that request at a later stage in response to negative public opinion. This effectively blocked all US corn exports to the EU because the US industry does not separate traditional from GMO corn. Although France subsequently gave approval for the two GMO corn varieties in July 1998, the dispute is illustrative of the type of problems that can and will arise.

The Canadian agri-food sector would be well advised to prepare itself for the introduction of labelling or other trade restrictions in the EU on the basis of "consumer concerns." There is a perception in North America that trade restrictions of this nature are merely the manifestation of lobbying on the part of vested (producer) interests in Europe. While this may be true in some cases, it would be a mistake to dismiss European consumer concerns out-of-hand. Whether or not based on sound scientific evidence (the requirement for trade restrictions under the SPS Agreement), consumer concerns over the health and safety of food products need to be better understood by exporters. The Canadian agri-food sector could pursue a number of paths to prepare itself for potential trade restrictions based on arguments of consumer concerns:

1. Market research in export markets to determine the extent of, and root causes of, apparent consumer concerns – this may point to a differentiated product marketing strategy if the concerns are manifest among a segment of consumers rather than en masse (e.g., GMO-free products, guaranteed minimum levels of GMOs, products containing GMOs, etc.);
2. Negotiation of equivalence or harmonization for Canadian and particular export market standards; and
3. Estimates of the likely cost to the Canadian agri-food sector and the "benefits" to importing country consumers in the event that trade restricting regulations are imposed.

E. Rules of Origin and Carrier Requirements

These are imposed either to restrict imports directly when countries are trying to encourage industrialization or to prevent tariff circumvention when the importer is a member of a Free Trade Area. Rules of origin requirements aimed at fostering industrialization do so by requiring that a certain proportion of the value of the good must have been added within the country in which it is to be sold. This is more common for industrial manufacturing goods than for agricultural products. Countries within a free trade area may have different external tariffs whilst goods move freely within the free trade area. This means that high tariff countries could have their tariffs circumvented if third party exporters export to low tariff countries within the free trade area and the goods are then trans-shipped within the free trade area to the high tariff country. For this reason, the high tariff country may negotiate a Rules of Origin agreement which requires that goods from its internal trading partner have a specified proportion of the value of the good added in the partner's country.

These can be imposed either by exporting or importing countries. An importing country may require that goods moving to its shores be transported on ships registered to that country or on the importing country's national airline. This can be a significant barrier to trade if insufficient carrier space exists or is not made available or affordable to the exporter. An exporting country may require goods to be exported using its flag carriers or national airline. This fosters domestic shipping and airline interests and is sometimes used in the delivery of foreign aid (Kerr and Perdikis, 1995).

F. Government Procurement

This NTB is probably less significant for the agri-food sector than for communications, defence, the energy sector, etc. Government purchases from the private sector are usually carried out through procurement contracts, often restricting bidders to nationally owned firms. Clearly this is a barrier to trade for potential suppliers in other countries. An Agreement on Government Procurement was reached in parallel with the Uruguay Round and has a small number of developed countries as its signatories. Government purchases which are sold either directly or indirectly would be covered under the WTO rules for state trading.

G. State Trading

An increasingly controversial NTB is the involvement of state trading enterprises (STEs) in international markets. It is not the intention of the GATT to force countries to privatise STEs or to alter their market structure - STEs are allowed under GATT rules. As Mattoo (1997) points out, GATT Article XVII on state trading does not prevent an STE from practising price discrimination in its sales "provided that different prices are charged for commercial reasons, to meet conditions of supply and demand in export markets." GATT Article XVII:1 requires each WTO member to undertake that:

> . . . if it established or maintains a State enterprise, wherever located, or grants to any enterprise, formally or in effect, exclusive or special privileges, such enterprise shall, in its purchases or sales involving either imports or exports, act in a manner consistent with the general principles of non-discriminatory treatment prescribed in this Agreement for governmental measures affecting imports or exports by private traders (as cited in Laird, 1997, p.7).

The purpose of the WTO rules is therefore to prevent STEs from undermining the WTO multilateral market access obligations of their governments. Canada can expect to face challenges under the WTO by the US in particular to institutions such as the Canadian Wheat Board and its marketing boards for example in the dairy, poultry and egg sectors. The Canadian defence of its STEs must rest on whether the institutions undermine Canada's market access obligations under WTO. State trading is quite prevalent in Japan particularly in its wheat, barley, milk products, leaf tobacco and rice markets. All these are expected to come under increasing pressure in the Next Round of Negotiations.

H. Import Procedures

These are almost endless as a potential source of NTBs and include such things as the documentation accompanying imports, port and customs procedures, etc. For exporters these procedures can be time consuming and can lead to delays in product shipment which are critical in the case of perishable food products. In Japan, for example, steps are being taken to accelerate port and customs procedures through the establishment of four new Foreign Access Zones, centralized locations for import-related operations, and facilities to streamline the distribution of cargo. The procedures are still lengthy by developed country standards. The recent situation in which some of the northern US states, e.g., Montana, North and South Dakota required extensive checks of documentation for trucks carrying Canadian grain and livestock across the border into the US is an example of how import procedures can be used to hamper

trade flows. Although these trade disruptions are often short-term in nature, they can be very damaging to an exporter. If the firm is unable to meet its supply commitments in the importing country, it may lose valuable customers who seek more reliable sources of supply. In terms of a long-term strategy, import procedures are best dealt with through negotiations to achieve harmonization of standards.

I. Contingency Protection

Contingency protection is WTO-legal barrier to trade rather than a non-tariff barrier but deserves a mention at this point because it is extremely important to Canadian agri-food trade. Counter measures include antidumping duties, countervailing duties and safeguard (or "anti-surge") measures. From the perspective of a long-term strategy at the WTO, the Canadian agri-food sector would benefit from a strengthening of the WTO rules concerning the definition of antidumping in particular. Antidumping measures are allowed in order to protect importing firms from the international equivalent of predatory pricing - selling below cost strategically to capture market share or drive firms in the importing country out of business. Under the WTO, dumping can be defined in one of three ways:

1. Selling in an export market at a price lower than in the domestic market;
2. Selling in an export market at a price lower than in a third country market; and
3. Selling in an export market at a price below the cost of production.

The problem with the first two definitions is that any profit-maximizing monopolist practices price discrimination. Price discrimination may simply be the process of capturing more value from differentiated markets, rather than dumping the product. The problem with the third definition is that during times of low world prices, exporters can be accused of dumping because they are selling at a loss, whilst producers in the importing country may be in exactly the same position. The challenge for the exporter accused of dumping is then to prove that they are following "normal business practices" by selling at less than the cost of production during a slump in the market rather than practising predatory pricing. This describes the situation faced by the Canadian beef industry in late 1998 and early 1999, with pending antidumping duties imposed by the US on Canadian beef exports. Depressed beef prices mean that producers in both Canada and the US may have been selling at less than the full cost of production.

The "nuisance value" of an antidumping duty to an importer in hampering trade – albeit temporarily in many cases – makes it a tempting strategy for restricting trade. Another incentive for imposing antidumping duties can be that, once an antidumping investigation is launched, the exporting country may try to negotiate a settlement with the importer which includes an undertaking to maintain export prices at an agreed level. As with a voluntary export restraint, from the exporter's perspective, this undertaking allows rents to be collected by the exporter, whereas the antidumping duty is collected by the importing country (Laird, 1997).

Clearly there is a need to tighten the definition of dumping in the next round of WTO negotiations so that antidumping duties are applied only in cases where deliberate *dumping* is occurring in contravention of the spirit of the WTO. As Laird (1997) observes:

> The predilection for antidumping action has arisen in part because industry has successfully lobbied for extensions of the national and international rules to such an extent that the only meaningful definition is 'anything you can get the government to act against under the antidumping law' (p.11).

Similarly, trade disruptions from the imposition of countervailing duties in response to an alleged subsidy can be extremely damaging to an exporter. A long-term objective of future WTO negotiations should be to reduce the opportunities for capricious use of this trade restricting measure.

The WTO Agreement allows countries to trigger special safeguards when imports rise by more than a pre-determined rate. For example, Japan has triggered special safeguards for a number of products subject to tariffication**.** These tend to be more transparent, less open to manipulation and their incidence easier to predict than other contingency protection measures.

J. Dispute Settlement

The WTO dispute settlement mechanism provides exporting countries with an avenue through which to challenge trade restrictions, including NTBs. The US has been the most active user of the WTO dispute settlement provisions. The dispute settlement mechanism represents both an opportunity and a challenge to the Canadian agri-food sector. Clearly Canada, as a major food exporter, benefits from the speedier settlement of trade disputes that the WTO mechanism offers relative to the previous GATT system. The challenge launched by Canada and the US to the EU ban on imports of meat and meat products produced using growth promoting hormones illustrates that the dispute settlement mechanism has worked to Canada's advantage.

Clearly Canada also benefits from challenges launched by third-party countries which, if successful, may enhance its access to export markets. For example, the US has challenged Japanese quarantine measures for agricultural product imports and complained about Korea's testing and inspection requirements for agricultural imports. The EU has also challenged Japanese measures affecting the import of pork products.

Canada faces challenges under the dispute settlement panel in its dairy sector. For example, in December 1997, New Zealand challenged the "special milk classes scheme" which it alleges is a dairy export subsidy scheme. In October 1997, the US launched a complaint about alleged Canadian export subsidies on dairy exports and the administration of the tariff-rate quota on Canadian milk imports.

As we move closer to the next round of WTO negotiations, non-tariff barrier issues will be critical. Strategies to negotiate equivalence and harmonization of standards between Canada and its major trading partners are important in lowering the transaction costs associated with international trade. Important in the forthcoming WTO Round will be negotiating processes to enhance dispute settlement, ideally to prevent disputes arising through a tightening of WTO rules.

5.3 The Model

The principal objective of the model is to determine the net benefits from the elimination of tariffs to Canada's agri-food industries. Thus, it is not only looking at the role of trade policy changes on the agri-food industries in Canada but industry response to those changes over a time horizon. This approach is not unique since many researchers have looked at trade policy changes and their impact on specified sectors, including agriculture (Roningen and Dixit, 1989; Tyers and Anderson, 1992; Mao et al., 1996). This study differed in its essence from most of the preceding studies in the sense that it is not driven by a partial or general equilibrium objective. That is, it focussed its attention on the effects of multilateral trade liberalization on the direct stakeholders in Canada's agri-food industries – producers and processors.

We use the system dynamics modelling (SDM) approach as the principal analytical tool in this research. This was done because it is dynamic by nature, allowing for the incorporation of feedbacks and multiple cross-effects with limited demand on data. Hence, the SDM approach enables us to mimic "reality" as much as it is **useful** in enhancing our appreciation of the implications of the policies we are evaluating. What is the SDM approach? System dynamics was originally developed by Forrester (1968) and his colleagues at MIT. Despite its name, system dynamics is used to model problems and not systems (Radzicki, 1996). In our case, the problem is how changes in trade policy will affect the net benefit situation of Canada's agri-food industries. Forrester's objective was to bring the "strength of human mind and the strength of computers" together to address system behaviour in a rigorous manner.

We define a system as a collection of parts for a purpose (Coyle, 1977). A system can be physical such as a machine, biological such a human being, ecological, economic or social. The important characteristic of the system is its boundary which must be defined to enable increased understanding and thereby engender effective policies or strategies to guide the achievement of desired results. The boundaries of the system are important in providing its internal coherence. All systems are subject to internal and external dynamics. For example, natural growth causes internal dynamics in biological systems such as human beings as well as ecological systems involving predators and preys. These dynamics may cause feedbacks which may yield unexpected outcomes. Understanding how these dynamics influence the system so they can be controlled, removed, or reinforced in order to improve the outcome or behaviour is the essence of system dynamics modelling.

Let us illustrate system dynamics with the agri-food sector. Suppose we define the boundary of the system as Canada's agri-food sector. Within this system are sub-systems (i.e., industries). Each of these subsystems may be influenced by one or more forces or dynamics occurring inside it or in another subsystem. For example, all agri-food industries compete for physical, financial, human and organizational resources. Therefore, an increase in the price of soybeans relative to corn will lead to an increase in the proportion of soybeans in farmers' crop rotations (competition for land). Similarly, an increase in corn and barley prices may lead to increased cost of production for beef and hog producers, leading to possible changes in the production level in those industries (competition for capital). Also, it is possible that an increase in demand for hogs by processors may lead to investment in hog production which will in turn lead to increased hog demand and/or investment in hog processing facilities. What

are the implications of these changes in hog production on beef and/or chicken production?

Economic agents have used, and use, mental models to deal with these forces and their consequences all the time. Hence, the question is not to use or ignore models; it is a choice among alternative models. Mental models are often fuzzy, incomplete and imprecisely stated (Sense, 1990). The human mind assembles only a few relationships to fit the context, causing mental models to be "unstable," sometimes changing within a single conversation. Thus, as the subject shifts, so does the model. Fundamental assumptions influence how people develop and use their mental models but because they are never brought to the fore, they are never discussed, leading to difficulties in developing a consensus.

The SDM approach draws on the mental models of decision-makers who live and work in the agri- food system and experience the problems or issues under consideration. However, by complementing these mental models with a computer elucidation of the mental models, it forces the verbalization, and hence the examination, of fundamental assumptions. Unlike the mental models, the computer models, which may be derived from the same mental models, are explicitly stated and the mathematical notation used to describe the model is unambiguous. Hence, the SDM is a clearer, simpler and more precise language than the mental model. It allows decision-makers with different mental models to focus on a single *computer* model, challenge its assumptions and seek solutions to, or insights about, the dynamics of a change in their "system."

The ability to simulate the system over time helps the decision-makers to increase their understanding of the change effects and enables them to develop processes to enhance positive outcomes and minimize negative ones. Thus, decision-makers are able to test the system's behaviour under parameter uncertainties and/or shocks (Bunn and Larsen, 1995). The SDM approach is, therefore, more user-friendly and under the decision-makers' control than any econometric model can be. In the words of Barry Richmond of HPS Inc., "Give the power to the people and let them figure out how to save themselves"(1997).

The principal limitation of the SDM is ensuring that the boundaries of the systems are broad enough to address all the questions under consideration and their internal structures are simple enough to facilitate understanding, conversation and learning. It also suffers from identifying the appropriate parameters and feedback loops (influence). These limitations are ameliorated through the participation of decision-makers in the research.

5.3.1 Model Boundary and Data Sources

The primary boundary of the model is Canada's agri-food sector. The subsystems within the boundary are the industries included in the model (Section 1.4). Within each of these subsystems (industries), the model looks at activities and trade liberalization policy effects at the production, processing and trade levels. As a result, the model required three distinct sets of data:

1. Quantity data, which encompassed quantity of various products at the production, processing and

trade levels.

2. Price data, covering farm prices, domestic wholesale prices, international prices and exchange rates.
3. Policy and technical parameters, covering the following:
    a. Price elasticities of demand and supply
    b. Cost of production
    c. Tariffs and tariff decline rates
    d. Price transmission elasticities
    e. Production and trade growth rates
    f. Technical coefficients for production and processing

The sources of these data were varied. For example, Canadian quantity data were obtained from Statistics Canada, Industry Canada, Agriculture and Agri-Food Canada (AAFC) and the USDA. Additionally, we supplemented national data with data obtained from industry groups, including the Canada Beef Export Federation, the Dairy Farmers of Canada, Dairy Farmers of Ontario, Canadian Meat Council and Canadian Pork Council. Historical price data were obtained from Statistics Canada and the USDA while baseline price and production projections were obtained from AAFC, USDA and Food and Agricultural Policy Research Institute (FAPRI). The policy and technical parameters were obtained from published academic works. Price elasticities of demand and supply were obtained from Roningen and Dixit (1989) and Tyers and Anderson (1992). Tariffs and tariff rate reductions were obtained from the WTO and estimated from member countries' submissions to the WTO under the Uruguay Round of GATT. Exchange rate data were obtained from Statistics Canada and we used the Canadian Imperial Bank of Commerce (CIBC) Economic Division's exchange rate forecast as a foundation for developing long term exchange rates.

The elasticities extracted from the literature were estimated using historical data under a completely different set of policies than those we are proposing to evaluate in this research. Therefore, there was reason to believe that supply responses will be very different in the future than they have been in the past. To address this limitation, we developed a number of groups made up of industry leaders and experts (Delphi groups) to review the results of the model using the parameters obtained from the literature. The objective was to determine if the relationship between the results their "mental models," or expectations, of the effects of the policy change on their industries. The groups' input was used to modify the parameters, the results of which are reported in Section 6.

5.3.2 The Scenarios

There is uncertainty about how tariffs will be treated during the period between the end of the Uruguay Round and the beginning of the Next Round. One group, led by the US, is advocating a continuation of the Uruguay Round tariff reduction until the rates agreed under the Next Round become effective. Another group, led by the EU, is of the opinion that tariff levels should be kept at their Uruguay Round bound levels so they serve as the initial rates for the Next Round.

Therefore, the study defined two broad policy scenarios based on expectations about tariff treatment between the end of the Uruguay Round and the commencement of the Next Round:

1. Continue to reduce tariffs at the Uruguay Round (UR) rate from 2000 until the negotiations end.
2. Freeze tariffs at the UR bound rates in 2000 until the negotiations end.

Under each of these broad scenarios, we have three principal scenarios:

a. Tariffs continue in the Next Round at their respective Uruguay Round rates of decline *ad infinitum* (BASE).
b. Tariffs under the Next Round are scheduled to be eliminated within a twenty-year phase-in (20-year sunset).
c. Tariffs under the Next Round are scheduled to be eliminated within a ten-year phase-in (10-year sunset).

Thus, together, there are six principal scenarios. Table 5.1 summarizes the nomenclature used for the various scenarios. To avoid repetition and confusion, we present the results of the Non-stop option in Section 6 and the tables of the results for the Pause option in Appendix 1.

Table 5.1: Summary of Principal Scenarios Evaluated in the Study

Major Scenarios	Non-Stop Option (Continuation of UR Tariff Reductions in 2000)	Pause Option (Stop UR Tariff Reductions in 2000)
Maintain UR tariff reduction rate	Non-Stop Base	Pause-Base
Sunset all tariffs in 10 years	10-Year Sunset (Nonstop)	10-Year Sunset (Pause)
Sunset all tariffs in 20 years	20-Year Sunset (Nonstop)	20-Year Sunset (Pause)

5.3.3 Principal Model Assumptions

The objective of the report is not to **forecast** the effects of trade liberalization but to project the changes in Canada's agri-food industries as the member-countries of the WTO continue moving towards trade liberalization. As such, the results provide a starting point for discussions of alternative strategies that may be initiated by the agri-food sector as a whole and by its component industries to take advantage of opportunities and/or deal with threats emerging from trade policy changes. There are three principal types of assumptions made in the study:

1. Broad Assumptions: The model

- Focusses only on the selected Canadian agri-food industries. This assumption implies that global production will respond to global market conditions in the same way as Canadian production.
- Is structured to export only products that use raw materials produced within the production

chain. Thus, it does not allow for re-exporting.

- Assumes homogeneity of products at each production level, not recognizing quality and other differentiating aspects of products which lead to higher value in the marketplace. For example, we use all wheat instead of breaking it into spring wheat, winter wheat, durum and Canadian Prairie Spring wheat or chicken breasts versus drumsticks.
- Does not explicitly include high value-added products such as ready-to-eat food products (eg. home meal replacement products, etc.) which incorporate inputs from more than one industry. This was due to the difficulty of allocating the value of those inputs to their appropriate industries. This assumption may result in the under-estimation of the net benefit from trade liberalization due to tariff escalation policies in most countries. To address this, the proportion of bulk commodities exports to production decreases, implicitly implying an increased domestic use of products for value-adding.
- Assumes that all production is sold. Therefore, on-farm use of grains and oilseeds is treated as part of total production that is sold. This could overestimate published farm cash receipts but reflects the true total value of production. Also, the assumption implies that there are no carry-overs.
- Assumes the principal feedbacks in the model are production-farm price and export volume-import price feedbacks. The supply response to farm price changes is reflected through changes in the stocks of productive resources, breeding herds or land.
- Assumes that Canadian exports go to the US or the Rest of the World (ROW), a composite of all importing countries. The characteristics of the country with the highest tariffs among the top ten importers of the product under consideration are assumed to represent the ROW for that product. This was done to get around the difficulty of incorporating all countries importing Canadian products. The rationale for this is that if Canada can export to the country with the highest tariff, then *ceteris paribus*, it should be able to export into countries with lower tariffs than that country's. The US was modelled explicitly because it is the largest importer of most Canadian agri-food products.

In addition to these broad modelling assumptions, the following environmental assumptions underlying the model are also defined:

- The projections are based on expected long term conditions and hence do not reflect short-term conditions which may affect trade in any particular year.
- All signatories to the next Round of WTO agreement (and other bilateral/multilateral trade agreements) will be in full compliance of the accord, so that there will be expected reductions in tariffs across all member-countries as well as the reduction/elimination of domestic and export subsidies. Projections assume such full compliance, including compliance with domestic and export subsidies.
- The weather is assumed to be normal with respect to agricultural production and no natural disasters or wars are assumed to occur.
- Agricultural demand is assumed to remain strong throughout the simulation horizon.
- Domestic government fiscal initiatives will be maintained, i.e., the federal and provincial government will continue to focus on the elimination of budgetary deficits and paying down

debts, keeping interest rates low and facilitating investments and higher productivity.

- Global economic growth conditions are expected to remain strong, leading to no surprises for agricultural production and consumption.
- Population growth projections will be maintained.
- Global income growth rates are also assumed to be maintained. This implies that an increasing number of consumers in developing countries will achieve the economic wherewithal to consume high-value agri-food imports as tariffs decline.
- China becomes a full-fledged WTO member by 2005.
- The policy reforms currently being undertaken in Asia in response to the Asian financial crisis will address the problem and return the region to stability within two to three years. Additionally, we assume that the long-term economic growth in the region is strong enough to support continued consumption of high value agricultural products.

2. Price assumptions

The following assumptions were made:

1. All prices are in current dollars and are exogenous to the model.
2. We worked on the theoretical expectation that reduction in tariffs lead to increasing prices. Using the baseline projections of Agriculture and Agri-Food Canada, the USDA and FAPRI as guides, we developed a base price projections for each of the products considered in this study. The methodology for the base price projections was quite simple, using the estimated growth rate of historical prices to project future prices from 1998 to 2024. The price projections in the two sunset scenarios were assumed to be the same as for the base price scenario until 2005 (when we assumed the Next Round to commence), at which point the accelerated reduction in tariffs allowed us to project relatively higher prices. The acceleration rate differed among the various industries. For example, prices were assumed to increase by 3.75% and 9% for the 20-year Sunset and the 10-year Sunset for canola compared to 3.35% and 10% for barley. These rates of increase in the base prices were obtained in consultation with industry leaders in focus group sessions.
3. Supply managed product prices were estimated off US prices at the farm and wholesale levels. For these products, the prices in the base and the two sunset scenarios were structured such that they increased at their estimated growth rates until they were less than the US price plus the appropriate tariff, at which point they were reduced to the US price plus the applicable tariffs in that year. This adjustment is necessary to ensure that imports do not occur when the gap between the domestic and international price is larger than the tariff.

3. Policy and other parameter assumptions

a. Tariffs are assumed to decline at the defined rates in each scenario. This assumption could be limiting since various industry observers believe that the supply managed industries will probably be allowed longer sunsets. On the other hand, given the *rhetoric* and trade disputes surrounding Canada's supply managed industries, it is very difficult to define "sensitive

industries" across the globe in an environment that is moving towards trade liberalization.[11]

b. The commencement of the implementation period for the next round of trade is not known. We, therefore, assume that it will be 2005 based on the assumption that the implementation of the Next Round will be held off until developing countries complete their Uruguay Round commitments in 2004.
c. Yield and productivity are assumed to increase at a decreasing rate. We used historical data to estimate rates of increase and adjusted these using industry stakeholders' expectations. This assumption enabled us to embed technological advances in the model, allowing productivity increases as well as cost reductions from initial (1997/98) levels. For example, dairy cow productivity was assumed to increase from 80 HL/cow per year to 98 HL/cow per year over the simulation period. This is equivalent to a 22.5% increase over twenty-six years. If we recognize that British Columbia herds on official Dairy Herd Improvement (DHI) milk recording programs are currently averaging more than 89 HL/cow per year, and available technology (recombinant Bovine Somatotropin) can boost production of the average cow by 15%, it becomes obvious that this top end cow productivity assumed in the models may be an underestimation. Similarly, meal and oil extraction efficiency for canola and soybeans were assumed to improve in a curvilinear fashion due to technological advances at both processing and seed levels.
d. The certainty of tariff sunsets is expected to change producers' supply response to price changes. We assumed that producers will respond more strongly to prices if they know for certain that protective tariffs preventing their access to certain markets are to be eliminated over a specified time frame. For example, the certainty of the elimination of beef and pork tariffs in Japan and Korea could lead Canadian producers to make long-term investments aimed at capturing those markets as tariffs come off. With this certainty, producers may even incur short-term losses to ensure that they achieve significant shares once the tariffs are eliminated. To this end, we allowed direct price elasticities under the sunset scenarios to be higher than under the base scenario. Also, the direct price elasticity under the 10-year sunset scenario was higher than that under the 20-year sunset scenario. We use the Roningen and Dixit (1989) elasticity estimates for the base scenario, under the assumption that the rate of change is slow enough to allow "the past to be like the future."
e. Crop production was defined as a function of acreage, which was itself defined as a function of exogenously-determined prices and elasticities. Livestock production was defined as function of prices and exogenously-determined elasticities. This may be presented mathematically as follows:

$$Y_{it} = aP_t^{\gamma_{ij}}$$

where a is the estimated intercept, Y_{it} and P_{it} describe the acreage or number of animals and the price of product i in period t, γ_{ij} represent the direct and cross-price elasticities of supply. Production, then, is the product of Y_{it} and the productivity of the animal or yield of the crop.

After production, products are divided into two groups, those destined for exports and those for the

[11] Recent trade disputes involving Canada's supply managed industries illustrate this problem.

domestic market. The products for the domestic market may undergo further processing and be consumed in the domestic market or exported. Processed products are estimated as a conversion from the primary products. That is:

$$Z_{y_{it}} = \omega\, Y_{it}$$

where Z is the processed product from primary product Y_{it} and ω is the conversion factor. It is virtually impossible to model Z when it involves more than one Y for this project because we would need the recipes to facilitate their distribution to the appropriate industries. Therefore, we do not model the further processing that occurs in which more than a single industry input is used. For example, home-meal replacements (which often includes meat or fish and vegetables, etc.), pastries (flour, butter or some vegetable shortening, sugar, etc.) and such products. It is important to understand, then, that the domestic sales include the component that goes into further processing. However, we explicitly modelled canola oil, canola meal, soy oil and soy meal production because they are principally a single-industry product.

Revenue is estimated at the farm and processing levels in the model. Processing level revenues are divided into two, domestic and export revenues. Variable costs are also estimated for crop and livestock production and for processing. These costs are assumed to decline over time due to productivity and technological improvements (Robinson and DeRosa, 1995). The net revenue at each level in an industry was the total revenue less variable costs, including the cost of direct input acquisition at the processing level. For example, the unit price per beef cattle was added to the variable processing costs, about $120 per head in the beef processing industry. Since processing costs account for input acquisition, the sum of the net revenues at the different levels is an indication of the value added created in the industry. We may summarize the foregoing as follows:

$$NR_{ft} = \alpha_{it} Y_{it} P_{it} - f(C_{it})$$

$$NR_{pt} = \sum_{j=1}^{2} \phi_j y_{jt} p_{jt} - g(C_{jt}) - \alpha_{it} Y_{it} P_{it}$$

where NR_f and NR_p are the net revenues at the farm and processing levels, α_{it} is yield or productivity and P and Y are as defined, while p_{jt} and y_{jt} are their equivalents at the processing level, ϕ_j is the proportion of product going to market j, where j is export and domestic markets and C is the variable cost of production. The sum of NR_f and NR_p is a measure of the value added emanating from the production and processing activities. The difference between the mean of this measure under each of the sunset scenarios (s_i) and its mean under the base scenario defines the mean net benefit for industry i (NB_i) resulting from trade liberalization. That is:

$$NB_i = \frac{1}{T}\sum_{t-1}^{20} \left[NR_{ft} + NR_{pt}\right]_{si} - \frac{1}{T}\sum_{t-1}^{T} \left[NR_{ft} + NR_{pt}\right]_{base}$$

These are the principal assumptions that define the results emanating from the model. It is important to note that the assumptions are not trivial and have significant effect on the outcome. Changing some

of these assumptions could result in significant changes in the model results. For example, assuming that prices in the sunset scenarios will rise faster and higher than assumed would influence the effect of tariff elimination on the relevant industries. Similarly, any natural catastrophe that affects the global economic conditions could lead to significant changes in the results.

Finally, it is important to recognize that this work was looking at the Canadian agri-food industry (and global agri-food markets) over a quarter of a century. We depended on industry leaders and experts to provide information about their expectations and transformed these into some of the model's parameters. We also have indicated the assumptions we used to conduct our price projections. The options for combining the various parameters, prices and assumptions were many and we made a choice for the one we used on the basis of our understanding of the industries and their environment. Changes in this understanding, as a result of changes in the revelation of the future, will influence the choices of parameters made.

Therefore, we want to state that this research should be viewed as a work in progress. Its results should be updated as information becomes available and stakeholders' behaviour changes due to changes in their environment. However, these current results should provide the foundation for understanding the potential benefits that liberalized agri-food trade could offer the individual agri-food industries and Canada's agri-food sector as a whole. The results should help the sector's stakeholders in developing a common understanding about the potential outcome of trade liberalization and other trade policies, and help them carve a single negotiation position.

The initialization parameters used in the model are presented in Table 5.2 for livestock industries and Table 5.3 for crop industries. These parameters cover initial values that are allowed to change throughout the simulation process. For example, prices and price ratios change the number of animals or acreage allocated to crops while technological improvements change the productivity in the various industries.

Table 5.2: Initialization Parameters for Livestock Industries in the Models

Industry		No. of Producing Animals	Producing Animal Productivity	Primary Processing Conversion Ratio	Processed Product Export Proportion
Beef	West	3,628,000	0.85 beef cattle/cow	0.3185 tonne/beef cattle	34.4%
	East	752,400			
Pork	West	452,100	20 pigs/sow	0.0817 tonne/pig	31.3%
	East	678,200			
Dairy	West	280,000	80 hl/cow	100 hL/tonne of cheese	6.8%
	East	987,310			
Chicken	West	156,916,000	2.1kg/bird	1.55kg/bird	9.4%
	East	377,293,000			
Egg	West	6,639,000	285.43 eggs/bird	-	16.0%
	East	11,426,000			

Table 5.3: Initializing Parameters for Crop Industries Included in the Models

Industry	No. of Hectares	Yield	Export Proportion
Wheat	11,570,000	2.1	64.3%
Barley	5,019,500	2.9	25.4%
Canola	3,451,000	1.4	49.8%
Soybean	875,993	2.6	24.3%
Corn	1,052,500	6.9	20.6%

6.1 Trade Liberalization Effects Under the Non-Stop Tariff Option

The non-stop tariff option is one of the major scenarios we are investigating. It involves a continuation of the Uruguay Round tariff reductions after 2000 until the commencement of the Next Round. The other is the tariff pause option, under which tariff levels under the Uruguay Round are frozen at their 2000 values until the beginning of the Next Round. Since the results are similar for the two options except for the rapidity of the sunset rates, and to avoid repetition, we present and discuss the simulation results of the effects of trade liberalization on Canadian agri-food industries under the non-stop option in this section and append the tables and graphs of the net benefit for the pause option.[12]

In evaluating the ensuing results, it is important for the reader to bear in mind the assumptions espoused in the preceding section. Each of them is critical in yielding the results of the system dynamic model used here. Because of the inter-relationships and feedbacks built into the model, a seemingly insignificant change in one assumption can lead to significant changes in the results.
The layout of the presentation is as follows. We first present the results by industry and by scenario, focussing on the incremental changes in the base scenario results relative to the sunset scenarios' results. The final section presents the total net benefit of total trade liberalization for the selected industries as well as presenting some thoughts on the extent of total net benefit accruing to consumer-ready products, which cannot be allocated to any particular industry.

6.2 Beef Industry

6.2.1 Base Scenario

Western Canada's share of beef cattle production has been increasing. Estimates of growth rates between 1990 and 1998 indicated an average growth rate of 3.56% per annum compared to 0.54% in Eastern Canada. The number of beef cows (the productive unit in the beef industry) for the two regions over the base scenario simulation period is presented in Figure 6.1. We built in a ten-year cattle cycle using historical cycle length of about ten years as well as historical liquidation and building rates. The proportion of Western beef cows increased from about 79% at the beginning of the simulation period to 88% at the end.

The Canadian beef industry has been a traditional net exporter of live cattle. However, increased slaughtering capacity in Western Canada is already changing this situation. As a result of this capacity enhancement as well as government supports, especially in Alberta, the proportion of live cattle exports is reduced from its current peak of 35% to 15% at the end of the simulation period in 2024. At the same time, we maintained the beef cow breeding rate at 85% throughout the period.

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[12] The principal difference between the two is that the pause option starts at higher tariff levels than the non-stop option, and hence requires higher rates of reduction to be sunset in the same time. As such, we assume that the rate of price increases under the sunset scenario is higher.

Figure 6.1: Distribution of Beef Cows Under the Base Scenario

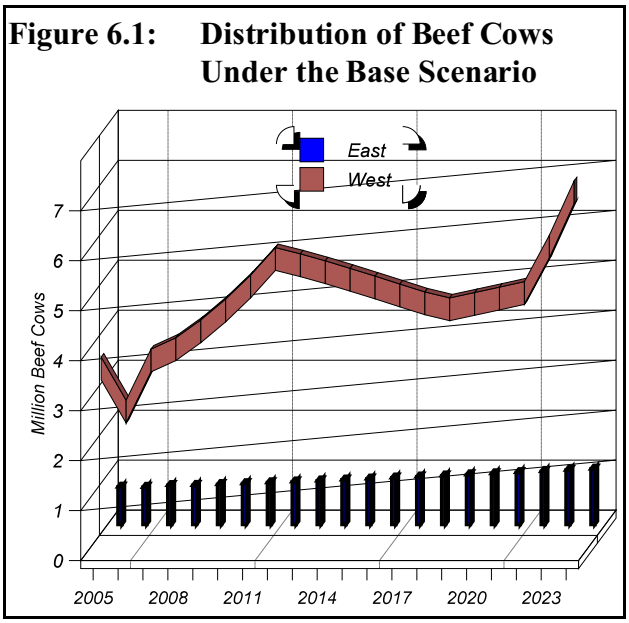
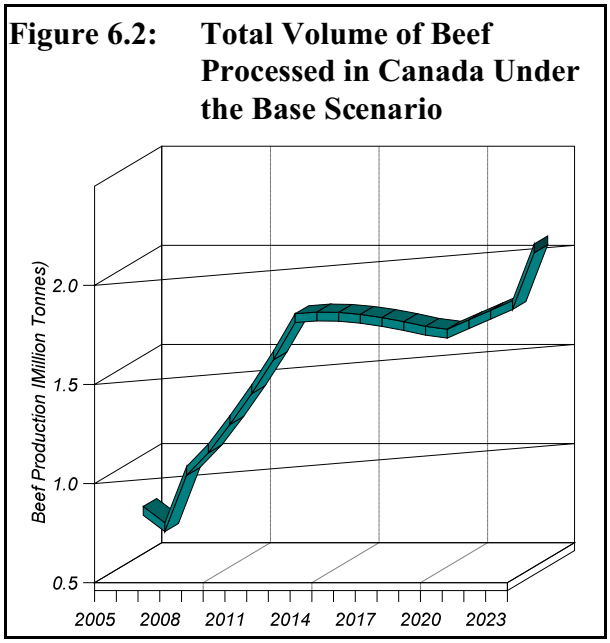


Figure 6.2: Total Volume of Beef Processed in Canada Under the Base Scenario



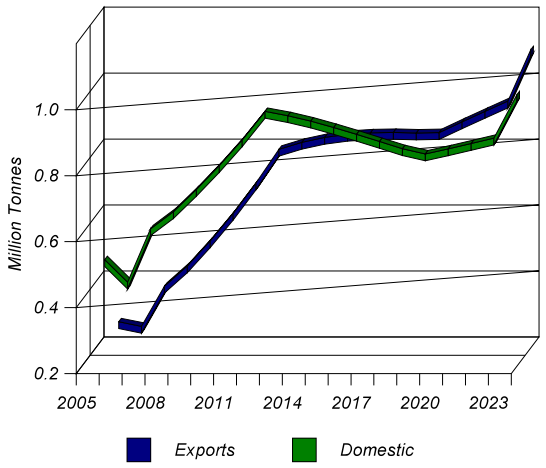
Carcass weight was allowed to increase from 318.7 kg in 1998 to 420 kg, based on the historical growth in carcass weights. It is important to note that live weight of beef animals at slaughter has also been increasing. As a result of this increase, the reduction in the live exports and the increase in the cattle numbers, Canadian beef production increased by more than 200% from about 782 thousand tonnes to 2.1 million tonnes over the 27-year simulation period (Figure 6.2).

The question that emerges is if the Canadian processing capacity can handle the projected beef processing volumes. Based on a 5.5-day week, a 50-week production year and single shifts for all beef plants (with the exception of Lakeside and Cargill in Alberta, which currently account for about 60% of total slaughter), annual slaughter capacity in Canada should be around 3.55 million head (or 70,000 to 75,000 per week) by the end of 1999. It is estimated that Western Canadian slaughter is around 2.59 million (51,800/week).

There have been no announced plans for expansion beyond these levels in the near future. The base scenario results indicate that the total Canadian processing capacity will be reached by 2011 when about 3.5 million beef cattle will be produced. Western Canada's portion of this (2.8 million) is greater than the current available processing capacity of 2.6 million per year in the region. Under the capacity estimation assumptions above, (and in the absence of diminishing returns), a movement of the whole industry to a double-shift production, would provide a total processing capacity of between 4.9 million and 5.25 million head per year.

If this movement to double-shift is feasible, then we may say that the industry currently has the capacity to absorb the beef cattle expansions projected under the base scenario. On the other hand, if the movement to double-shift processing has embedded in it some diminishing returns, implying that the total capacity range is smaller than the estimated, then the industry will need to evaluate the potential

Figure 6.3: Distribution of Beef Between the Domestic and Export Markets Under the Base Scenario



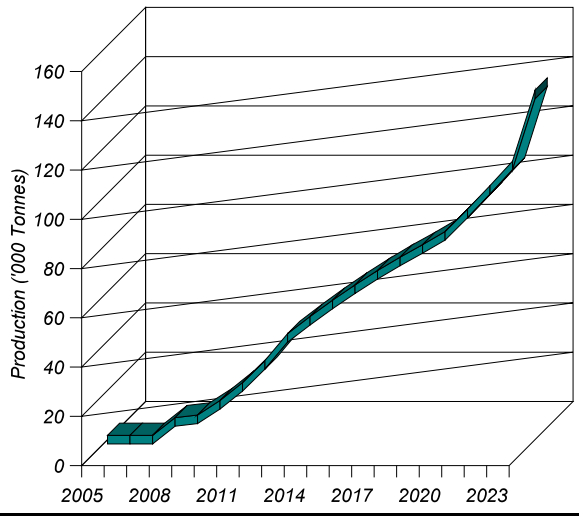
for expanding its processing capacity if it is going to take advantage of the projected growth opportunities. Although processing capacity is the principal issue that the industry has to consider, some observers believe that the potentially more critical constraint for the industry at the processing level is labour availability. This is especially true in Western Canada (George Morris Centre et al., 1997). In that study, industry leaders indicated the high turnover and the skills gaps in their industry.

Beef production is divided into exports and domestic use. Domestic use is divided into consumer (end-user) and further processing uses. The projections of these for the simulation period are presented in Figure 6.3. Domestic beef increased from about 0.6 million tonnes ofb eef in 2005 to more than 1 million tonnes while exports increased from a little over 0.2 million tones to almost 1 million tonnes. Domestic use and exports, because of the nature of the equations underlying the model, follow the cycles observed in beef production.

6.2.2 20-Year Scenario

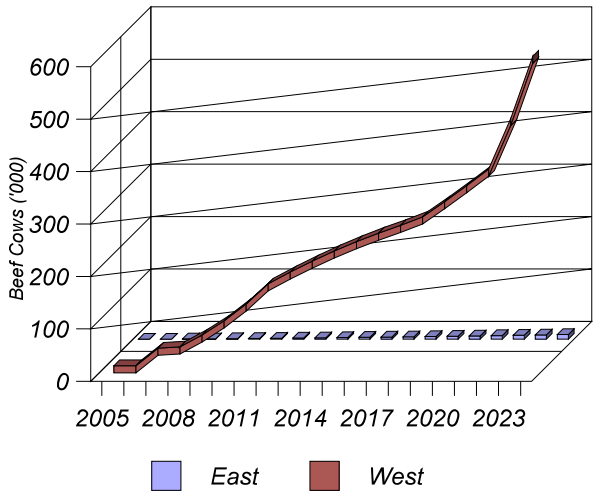
The beef cow numbers under the 20-year Scenario followed a similar pattern as under the Base Scenario. However, there were higher numbers of beef cows, and hence, feeder calves and slaughter animals under this scenario than under the Base Scenario. The difference in beef cow numbers under 20-Year Scenario compared to the Base Scenario for both Eastern and Western Canada is presented in Figure 6.4. The figure shows a significant increase in the West while the beef cow population in the East remained almost unchanged under the 20-year Sunset Scenario in comparison to the Base Scenario. Thus, it seems conditions in the Western Canadian beef industry allow it to respond more *aggressively* to the reduction in international tariffs. Indeed, by the end of the simulation period, the total beef cow population in Western Canada had increased by about 16% in comparison to the initial level. Contrarily, beef cow population in the East increased by only

Figure 6.4: Incremental Beef Produced Between 20-Year Sunset and Base Scenarios



1%!

Figure 6.5: Incremental Beef Cow Population Between Base and 20-Year Sunset Scenarios

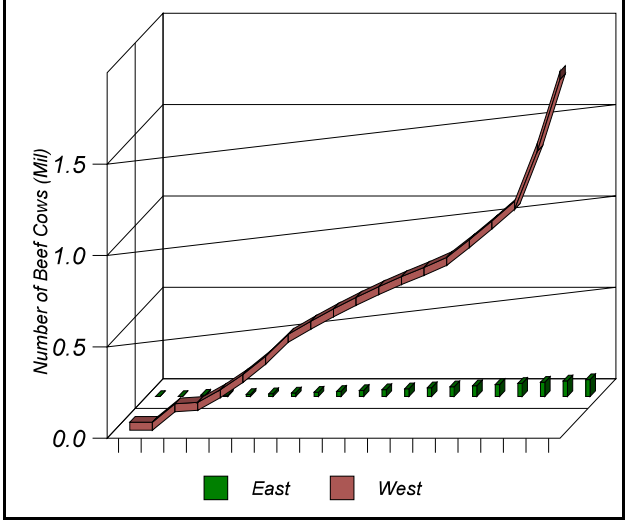


The total beef produced under the 20-Year Scenario increased over time as under the Base Scenario. At the end of the simulation period, the total beef produced is about 2.25 million tonnes, of which about 1.08 million tonnes are consumed in the domestic market. The proportion of production accounted for by total beef exports presented in the Figure 6.5 increase from about 34% in 2005 to 52% in 2024.

The difference in total beef produced at the end of the simulation period between the 20-year Sunset Scenario and the Base Scenario was more than 140 thousand tonnes (Figure 6.5). Recalling that the base scenario had virtually no beef left over for further processing, the foregoing implies that the consumer-ready processing industry has access to about 140 thousand tonnes of beef. This implies an increase in the total value of the beef industry resulting from the change in trade policy.

The question of developing consumer-ready beef products needs to be looked at seriously by the industry so that it can take full advantage of the changing environment. This is because consumer trend forecasts all point to consumers demanding high value-added products that are convenient to use (Feather, 1994).

Figure 6.6: Incremental Beef Cow Population Between 10-Year Sunset and Base Scenarios



6.2.3 10-Year Scenario

This scenario looks at the ten-year sunset of all agri-food tariffs and simulates the potential effects on the beef industry. The incremental effect of this on beef cow populations is presented in Figure 6.6. Compared to the Base Scenario, where tariffs are allowed to decline at the Uruguay Round rate at infinitum, it is observed that a rapid sunset on tariffs allows the beef industry to increase its beef cow population. The total population of beef cows in the country by 2024 is about 46% higher than in 2005. What is interesting, but obvious to every industry watcher, is that the distribution of the increase is very skewed to Western Canada, which accounts for more than 95% of the total increase. This increase in beef cow population

implies an increase in the total beef processed in the country. The result is that the projected incremental beef produced vis-a-vis the base scenario is in excess of 2.57 million tonnes by 2024. This is equivalent to a 22.4% increase over the same time under the base scenario. This implies about 6.11 million beef cattle are slaughtered by 2024 which is in excess of the current capacity as estimated in previous sections. The implication is that the Canadian beef processing industry, if it is going to take advantage of the growth opportunity confronting it under a rapidly declining tariff environment would need to increase its capacity by at least 16.4% of the current capacity.[13]

Total incremental beef exports reach 244.6 thousand tonnes by the end of the simulation period under the 10-year sunset scenario (vis-a-vis the base scenario) while incremental beef used in the domestic market is 226.6 thousand tonnes. Using our projected Canadian population of 39.73 million in 2024 and a per capita beef consumption of 25.89kg, this implies an availability of about 210.9 thousand more tonnes for further processing. From previous estimations (Section 2.3), we could expect a significant portion of this ending up in export markets as part of consumer-ready food products. We currently do not know the proportion of the beef industry in total consumer-ready products, but the foregoing indicates the need for conversation about enhanced opportunities in higher value-added initiatives in the industry.

6.2.4 Net Benefit for the Beef Industry

Recall from Section 5 that we defined net benefit as the incremental net revenue resulting from the total liberalization of trade policies. Given the assumptions under which the system dynamic model was simulated, the net benefit for the beef industry as a result of the elimination of tariff barriers under the two sunset scenarios with the base as a reference is presented in this sub-section.

Table 6.1 shows the average annual revenues, variable costs and net revenues at each level of production and for each of the scenarios over the total simulation period. The variable costs for beef production are estimated at the feedlot level, and include feeder cost and feeding cost. Farm revenue is based on the number of animals sold for slaughter, carcass weight and price. At the processing level, variable costs include only costs of processing (labour, etc.) and the cost of the beef animal. Processor revenues are estimated from both meat sales and by-product sales. The net revenues at the different levels are the respective differences between their revenues and costs. The net benefit from trade liberalization under a sunset scenario is the sum of the industry net revenues under that sunset scenario minus that under the base scenario.

Farm revenue and processing revenue under the 10-year scenario and the 20-year scenario are about 15% and 6% respectively higher in comparison to the base scenario. Total industry net revenue, which is the sum of the net revenues at the farm and processing levels, is 7.5% and 17.35% higher under the 20-year and 10-year sunset scenarios in comparison to the base scenario.

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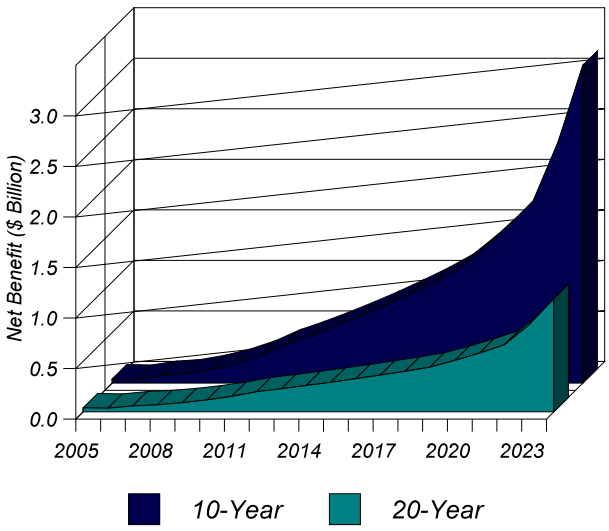
[13] The assumption is that all beef slaughter plants are currently double-shift, putting the current total potential capacity of 5.25 million head per year.

The estimated average annual net benefit from the 20-year sunset policy option is $341 million compared to $1.13 billion under the 10-year scenario. Thus, if the negotiators at the Next Round of WTO decide to eliminate all agri-food tariffs within ten years instead of maintaining the Uruguay Round reduction rates, and all countries fully comply with such commitment (i.e., do not introduce new non-tariff barriers, etc.) then, the Canadian beef industry can expect to increase its net revenues by a total of $6.82 billion over the twenty years. The total net benefit from total trade liberalization under the 10-year scenario is $22.53 billion over twenty years.

Table 6.1: Summary of Average Annual Net Effects of Tariff Elimination (Million Dollars)

Items	Base	20-Year	10-Year
Farm Revenue	5,917.88	6,278.95	7,111.32
Processing Revenue	7,362.65	7,807.18	8,831.24
Farm Cost	2,896.57	3,003.38	3,248.99
Processing Cost	6,490.98	6,874.41	7,031.76
Farm Net Revenue	3,021.31	3,275.57	3,862.34
Processing Net Revenue	1,514.15	1,600.69	1,799.48
Total Industry Net Revenue	4,535.46	4,876.26	5,661.81
Net Benefit		**340.79**	**1,126.35**

Figure 6.7: Net Benefit From Trade Liberalization Under the 10-Year and 20-Year Sunset Scenarios



The trend in the net benefit from trade liberalization for the two sunset scenarios is presented in Figure 6.7. The figure illustrates the amplifying effect of trade liberalization which is not observed with averages. Although the net benefits between the two scenarios were similar at the beginning, there was about $2 billion between them at the end of the simulation period in 2024. At this point, the net benefit from the 10-year sunset scenario is $3.14 billion compared to $1.12 billion for the 20-year scenario. Hence, the benefits accelerate over time, as tariffs continue to be eliminated. It also shows the opportunity cost of not eliminating the tariffs fast enough. For example, the wedge between the two net benefits shows the net benefits foregone if the outcome of the next round of WTO negotiations is a 20-year instead of a 10-year sunset on all agri-food tariffs.

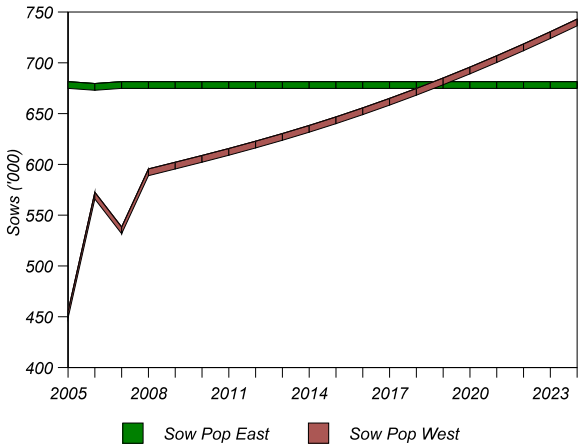
6.3 Pork Industry

6.3.1 Base Scenario

Although an increasingly significant number of hog farmers are purchasing their replacements from breeding companies, the location of sows is still an indicator of growth in the hog industry since sows are the production units in the industry. Amanor-Boadu (1998) estimated the distribution of breeding stock in the industry is shifting to the west. For example, Ontario and Quebec together accounted for about 59% of all hog breeding stock in the country in1987. By 1996, this has dwindled to 53% and is continuing to decline. Industry watchers believe that feed, access to market and processing investments will all continue to increase the West's attractiveness vis-a-vis hog production and processing. This reality underlies the ensuing simulation to determine the effect of tariff elimination on the Canadian hog/pork industry's performance.

The number of sows (the productive unit in the pork industry) for Western and Eastern Canada under the base scenario simulation is presented in Figure 6.8. The proportion of Western sows increased from about 40% at the beginning of the simulation period to 52% at the end. This is based on the continuation of the recent pattern of growth rates between the two regions. Using Statistics Canada data, we estimated the average annual growth rate in hogs on farms between 1990 and 1998 to be 2.35% in the West and 1.62% in the East. Thus, total sow population in the country increases from about 1.13 million to about 1.4 million between 2005 and 2024, a 25.4% increase.

Figure 6.8: Distribution of Sows Under Base Scenario

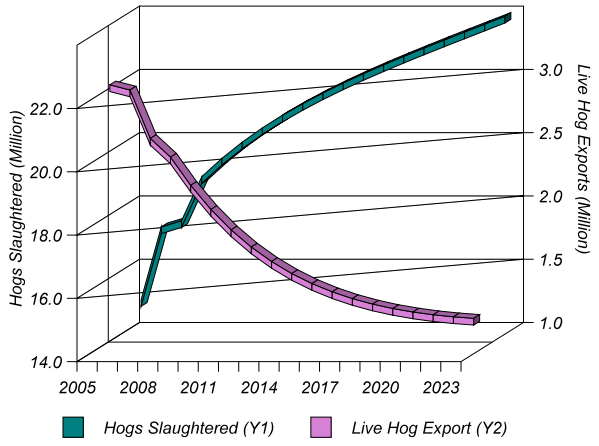


The total number of hogs slaughtered is projected to increase by about 60%, from about 14 million in 2006 to 24 million in 2024. Industry watchers believe that slaughter at the beginning of the simulation period is equivalent to 52% of total processing capacity, implying that the industry could take another 12 million hogs per year without major expansion. However, there have been announcements for major expansions, particularly in Western Canada over the past few years, all contributing to the industry's capacity to process more hogs. As was the case with beef, the potential bottleneck in the pork processing industry may turn out to be labour availability.

The projected increases in slaughter are a combination of increases in sow numbers and the reduction

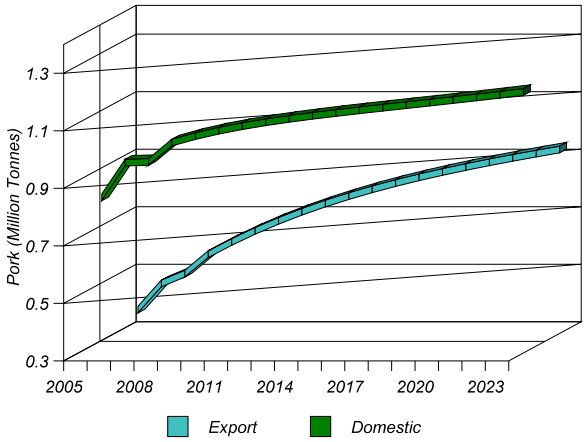
in live exports. The trends in hog slaughter and live exports are presented in Figure 6.9. The number of live exports is projected to decrease by almost 60%.

Figure 6.9: Live Exports and Slaughter Under Base Scenario Projections



The volume of pork produced is projected to increase from about 1.2 million tonnes in 2005 to 2.1 million tonnes in 2024, an average of 14.8% per annum increase over the period. Production is distributed between domestic and export markets (Figure 6.10). By 2024, it is projected that total pork destined for the domestic market will be about 1.2 million tonnes, compared to about 940 thousand tonnes exported. Under this projection, Canadian pork exports will have increased by 145% compared to a 44% increase in domestic use. Recall that domestic use is divided between direct consumption and further processing. With a projected per capita consumption for pork in 2024 of 29.2 kg, (using historical and Agriculture and Agri-Food Canada baseline projections) and Canadian population of 39.78 million, total direct consumption is calculated to be 1.1 million tonnes, which leaves, according to our assumption, just about 0.1 million more tonnes for further processing.

Figure 6.10: Projected Distribution of Pork Production Under Base Scenario



6.3.2 20-Year Scenario

Sow numbers, on average, Increased by about 24% by the 2024 under the 20-year Scenario compared to the same period under the Base Scenario. In relative terms, all the increases in sow populations came from the West. By the end of the simulation period, there were 337 thousand more sows in the West compared to about 1,700 in East. This migration to the West is driven by the fact that there is a higher direct price elasticity for Western producers and a higher growth rate for sow numbers based on the historical response to market conditions.

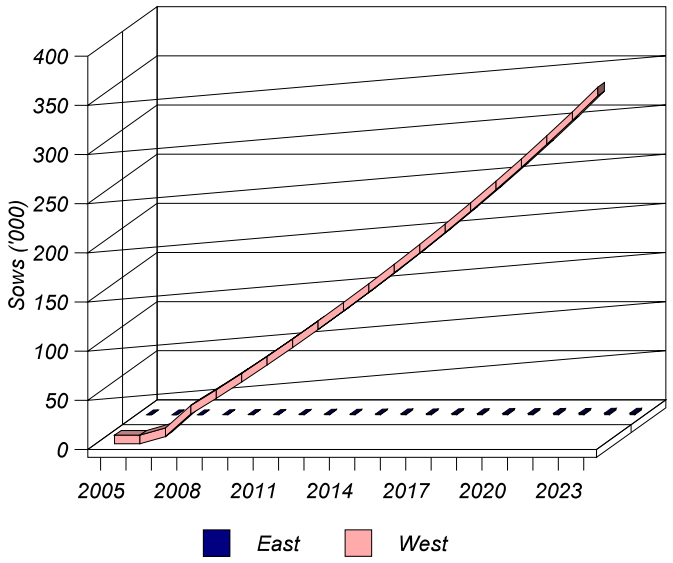
The total number of hogs slaughtered increases to about 28.9 million by 2024 under the 20-year scenario, an increase of almost 5 million hogs compared to the base scenario. This begins to put pressure on the existing slaughter capacity in the country. However, historically, it has always been processing capacity that has driven production. Therefore, with the bright prospects predicted for the industry, despite its recent difficulties, such developments would facilitate the absorption of the increase kill.

Total pork production also increased by 448 thousand tonnes, a 17% increase over same period in the base scenario. This implied, under the same distribution as indicated for the base scenario, about 252 thousand tonnes in the domestic market. Thus, the pork further processing industry has available about 352,000 tonnes for creating higher value consumer-ready products. In the mean time, exports increased by 196,000 tonnes under the 20-year scenario in comparison to the base scenario.

6.3.3 10-Year Scenario

The incremental sow population under the 10-year scenario with respect to the base scenario is presented in Figure 6.11. The West is projected to increase its sow population by a little over 353,000. Contrarily, sow population in the East is maintained at virtually the base scenario levels. This shift in industry location is already happening as larger multinational breeding operations open up in the West. There are a number of advantages to these operations. For example, they are more capable of developing *designer hogs* targeted for specific market segments because they have the diversity in genetics to undertake such ventures. Also, they are more likely to be able to enter in vertical relationships along the supply chain to facilitate the emerging market requirements of traceability and identity preservation. Another factor driving the West's hog industry is its feed cost advantage (Kruja et al., 1998).

Figure 6.11: Incremental Sow Population Between 10-Year Sunset and Base Scenarios



The result of this dramatic increase in sow population is an increase in slaughtered hogs. Total slaughtered hogs is projected to increase by 5.6 million compared to the base scenario. This implies that total hogs slaughtered in the country by 2024 under the 20-year sunset scenario is about 29.57 million. Given our estimates, of existing capacity, this volume exceeds current capacity by about 9.7%. Hence, the industry may have to put brakes on its response to changes in international trade policies or undertake the necessary investments to capitalize on the opportunities.

It is important to note that a principal assumption underlying the projections is that all market players will respond accordingly to the changing environment. The major shift in hog production is expected to occur in Europe where environmental and other resource constraints restrict expansions (Amanor-Boadu, 1998). However, other studies point to expansion potential in South America and the US (Martin et al., 1998). These will be major competing forces for the Canadian industry. What becomes apparent is that it will be very difficult for the industry (and many other industries for that matter) to

succeed in a more liberalized trade environment with its existing structures . The need for the Canadian pork industry to evaluate its internal structures as it prepares for a more competitive marketplace becomes imperative.

Total pork exports reach 1.16 million tonnes by the end of the simulation period under the 10-year sunset scenario (vis-a-vis the base scenario) while incremental pork used in the domestic market is about 0.5 million tonnes. Given our assumptions about direct consumption requirements, the total volume of pork available for further processing increases by almost 400,000 tonnes. This enhances the industry's ability to increase its share of consumer-ready production for both domestic and the international markets.

6.3.4 Net Benefit for the Pork Industry

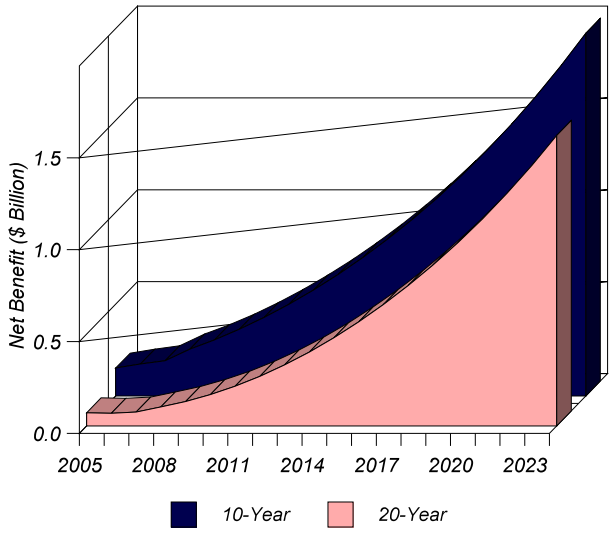
Table 6.2 shows the average revenues, costs and net revenues at each level of production and for each of the scenarios over the total simulation period. It also shows the net benefit from trade liberalization under the two sunset scenarios. Farm revenue and processing revenue under the 10-year scenario and the 20-year scenario are about 10.9% and 15.7% respectively higher in comparison to the base scenario. Total industry net revenue, which is the sum of the net revenues at the farm and processing levels, is 15.71% and 22.62% higher under the 20-year and 10-year sunset scenarios respectively in comparison to the base scenario. The estimated average annual net benefit from the 20-year sunset policy option is $578.9 million compared to $833.8 million under the 10-year scenario. Thus, if the negotiators at the Next Round of WTO decide to eliminate all agri-food tariffs within ten years instead of maintaining the Uruguay Round reduction rates, and all countries fully comply with the Agreement, then the Canadian pork industry can expect to increase its net revenues by a total of $16.68 billion over the twenty years in comparison with continuing global tariff reductions at the Uruguay Round rates. On the other hand, if the sunset on all tariffs is twenty years, then the cumulative net benefit from total trade liberalization for the Canadian pork industry is $11.58 billion over twenty years.

Table 6.2: Summary of Average Annual Net Effects of Tariff Elimination for the Pork Industry (Million Dollars)

Items	BASE	20-YEAR	10-YEAR
Farm Revenue	3,193.02	3541.7	3,695.03
Processing Revenue	6,558.27	7,409.68	7736.49
Farm Cost	2,509.75	2,748.41	2,811.28
Processing Cost	3556.5	3939.05	4101.42
Farm Net Revenue	683.28	793.29	883.75
Processing Net Revenue	3001.77	3470.63	3635.07
Total Industry Net Revenue	3685.05	4263.92	4518.82
Net Benefit		**578.87**	**833.77**

The trend in the net benefit from trade liberalization for the two sunset scenarios is presented in Figure 6.12. The figure illustrates the amplifying effect of trade liberalization which is not observed with

Figure 6.12: Net Benefit From Trade Liberalization for Pork Under the 10-Year and 20-Year Sunset Scenarios



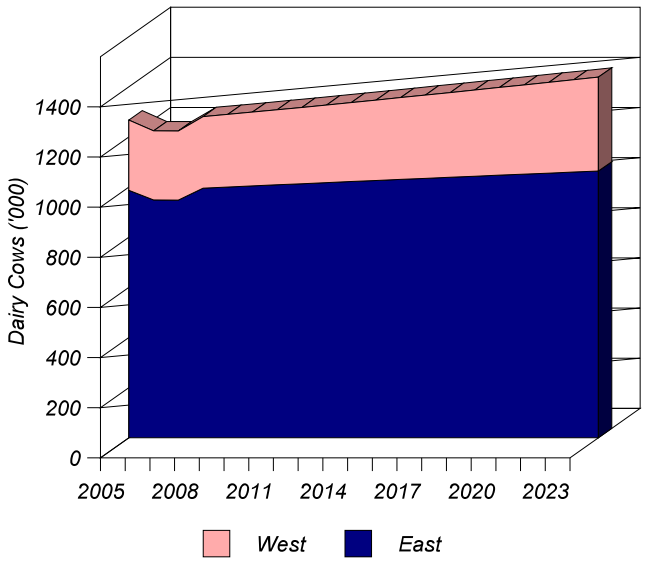
averages. The net benefits under the 10-year scenario exceeded that for the 20-year scenario throughout the simulation period. By 2024, the 10-year scenario had a net benefit of about $400 million more than the 20-year scenario. Thus, cumulatively, there is a wedge equivalent to about $2.6 billion which may be looked at as the opportunity cost of a 20-year sunset over a 10-year sunset for agri-food tariffs for the pork industry. From this perspective, it behoves negotiators to focus on as quick an elimination of the tariffs as it is possible to maximize the net benefits to the industry. However, the attendant implication is that industry stakeholders also need to double their efforts in organizing their internal structures to take full advantage of the opportunities offered by the elimination of tariffs.

6.4 Dairy Industry

6.4.1 Base Scenario

The Canadian dairy industry has been a staunch watcher of international trade negotiations principally because of the orderly production and marketing structure under which it operates. A movement to a full liberalized trade environment pressures the industry to alter its structure, which is perceived by some to pose inherent difficulties for dairy producers and processors. The ensuing analysis attempts to capture the potential changes that may occur in the industry as we move towards a more liberalized trade environment. As stated in earlier segments of this report, it is important to bear in mind the assumptions underlying the system dynamic model used in estimating the effects of trade liberalization. For example, we have assumed that as rural and urban boundaries disappear in Eastern Canada, environmental conditions (manure disposal, water, etc.) will increasingly lead to

Figure 6.13: Distribution of Dairy Cows Under the Base Scenario

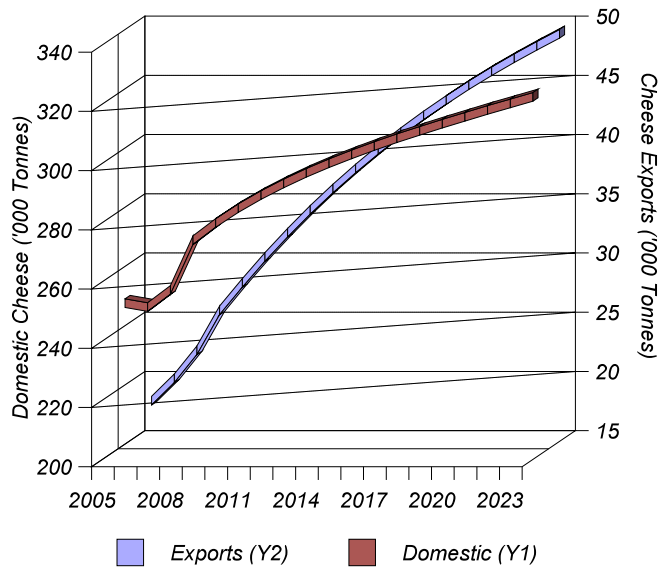


a shift of dairy production to the West. This assumption is reflected in the model in the form of the underlying growth rates in the regional cow numbers, a maximum of -0.05% and 1% per annum for the East and the West respectively. These rates were based on historical data from Statistics Canada as well as adjustments based on our expectations about the constraints described earlier. Industry stakeholders were of the opinion that these estimates were conservative, i.e., both the growth and decline rates would be higher.

On the basis of the foregoing, the distribution of dairy cows between the West and the East under the base scenario conditions is presented in Figure 6.13. The effect of the simulation was an increase in the proportion of the West's dairy cows by about 4%, from 22% in 2025 to 26% in 2025. This is realistic principally because fluid milk will continue to be produced closer to its market. The East will continue to be the population centre of the country into the next century, maintaining its importance in the dairy population. Total dairy cow population increased by only 13% between 2005 and 2024. While we have not at any time in this research evaluated the organizational restructuring that will occur with the policy changes (farm sizes, number of farms, etc.), all industry leaders we conversed with are of the opinion that there will be a radical reduction in the number of dairy producers as we move towards a liberalized trade environment.

With improvement in cow productivity over the period, the quantity of milk produced increased much more than the increase in dairy cows. The initial cow productivity of 80 hectolitre was allowed to increase to 98 hectolitres over the simulation period, equivalent to a 22.5% increase over twenty-seven years. If anyone thinks this is a dramatic increase, it must be remembered that technology is currently available to increase productivity of poor performing cows by an average of up to 15%, increasing the overall average productivity of the population.

Figure 6.14: Distribution of Cheese Produced Under the Base Scenario



Volume of milk produced is projected for the base scenario to increase by about 37% between 2005 and 2024, much higher than the 13% increase in cow numbers. This volume of milk is divided between fluid and industrial use. Since fluid milk is not traded, we do not model it. For processed products developed from the industrial component, we focus only on cheese in the model. Our rationale for this is that cheese is the *most "free-traded"* dairy product in relation to the others (skim milk powder, butter, etc.). The quantity of cheese produced is assumed to be a constant proportion to milk production. The conversion rate used was 10 litres per kilogram of cheese. We did not change this throughout the simulation period because there was little information to determine changes in cheese productivity.

Another limitation is that cheese is undifferentiated in the model, although we know that there is significant differentiation with very varied prices.

Total cheese produced in the base scenario increased from 271 thousand tonnes in 2005 to 372 thousand tonnes in 2024. This was distributed between domestic use and the export market. This distribution is presented in Figure 6.14. Cheese exports account for about 15% of total cheese produced by 2024. Per capita consumption of cheese is projected to reach 15.91 kg by 2024. With a national population of 39.78, million, this means a total consumption of 633,059 tonnes by 2024. This shows that Canada is not self-sufficient in cheese production at the end of the simulation period. This is to be expected given the extensive heterogeneity in cheese demand. Therefore, the gap in consumption is met by imports, which may increase due to the declining domestic tariffs on dairy products.

6.4.2 20-Year Scenario

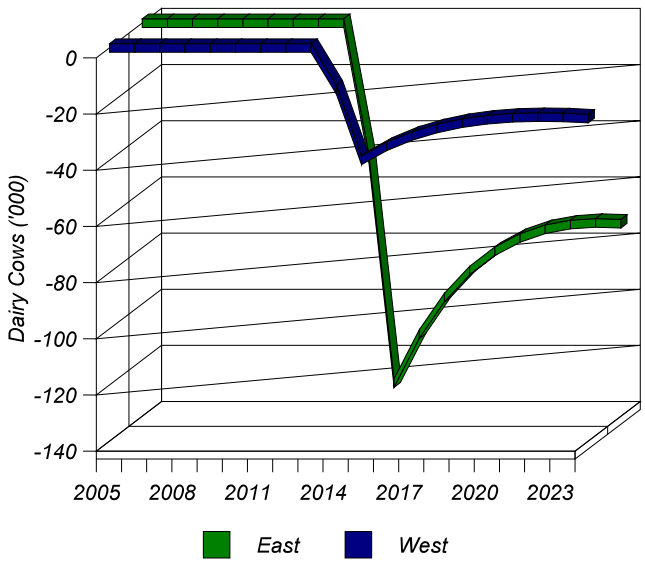
Since the assumptions of the model make clear the fact that dairy industry tariffs will be effective for a significantly long period (19-20 years) under the 20-year scenario, we allow dairy producers to maintain their direct price elasticities as in the base scenario. The net effect of this is that the incremental change in dairy cows is zero until the last two periods of the simulation when it drops by almost 12,700 cows. The same is true of cheese production, which declines in the last year by almost 8% to 359,200 tonnes from 372,000. Since cheese production is defined as a constant function of milk production, the reduction in dairy cows results in a reduction in cheese production. The estimated reduction in cheese production in the final year is about 3.5% in comparison to the base scenario.

These reductions are expected as tariffs fall and milk prices, which are traditionally above the world price, fall towards that price. The relatively small reduction in cow numbers is a reflection of the adjustments that occur in the industry. High cost producers will be incapable of maintaining production under a zero tariff environment, however, low-cost producers will take advantage of the situation, increase their herd sizes and enhance their efficiencies. Kennelly (1995) and others have pointed out that larger herd sizes will become necessary for maintaining competitive advantage in a more liberalized trade environment. While this is generally true, it is important to recognize the parallel emergence of well-demarcated market segments as well as the need for traceability of products. What impact these major shifts in consumer markets will have on the structure of agri-food industries, especially those that have experienced significant protection from the turbulence of the world market remains to be seen . It is critical that industry leaders recognize these shifts and take advantage of inherent opportunities.

6.4.3 10-Year Scenario

The number of dairy cows under the 10-year scenario with respect to the base scenario is presented in Figure 6.15. The industry's reaction to the end of the protective tariffs is illustrated by the rather massive reductions in dairy cows. The relative reduction in cow numbers is the same in the East as in the West since both are reacting to the same price and exhibit the same direct price elasticities. In the three years following the ineffectiveness of tariffs (2014-2016), cow numbers dropped by 5%, 14% and 12% respectively. The industry begins to recover by rebuilding herds as prices begin edging up from 2017. However, they do not get to their pre-drop levels. We believe, as do the industry leaders we held numerous conversations with, that the reduction in the number of farms will be far less than the reduction in the number of cows.

Figure 6.15: Incremental Dairy Cow Population Between 10-Year Sunset and Base Scenarios



There are a lot of issues that need to be addressed by the dairy industry stakeholders in the face of these potential changes. It is important to recognize that these issues are not the focus of this research but need to be highlighted since they affect the policy environment as trade negotiators consider the possibility of tariff sunsets for agri-food products. Some of these issues include treatment of quota and quota value. There are also the social issues associated with an increased attrition rate in the dairy industry and the effect that will have on certain rural economies. All these issues need to be evaluated and strategies developed to minimize their negative impacts whilst the opportunities they present are seized aggressively.

Some within the industry maintain that there will still be need for "supply management" in the sense that the emerging market environment will require vertical relationships along the supply chain. Therefore, supply will be managed through understanding of the chain's market needs instead of an attempt to satisfy a provincial or national dairy need. The various aspects of these changes need to be discussed and evaluated by the industry.

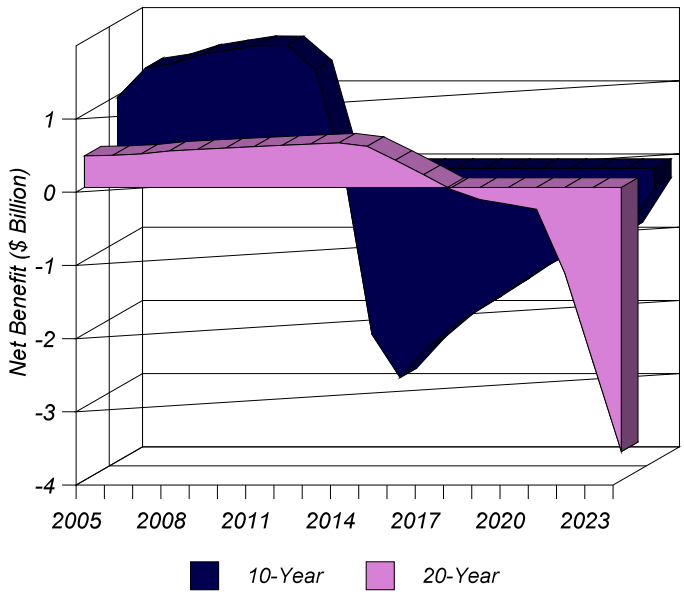
6.4.4 Net Benefit for the Dairy Industry

Table 6.3 shows the average revenues, costs and net revenues at each level of production and for each of the scenarios over the total simulation period. It also shows the net benefit from trade liberalization under the two sunset scenarios.

Table 6.3: Summary of Average Annual Net Effects of Tariff Elimination for the Dairy Industry (Million Dollars)

Items	BASE	20-YEAR	10-YEAR
Farm Revenue	8,723.25	8,858.43	8,580.22
Processing Revenue	2,866.63	2,632.54	2,541.06
Farm Cost	3,170.23	3,151.34	3,020.84
Processing Cost	215.14	213.92	205.29
Farm Net Revenue	5,553.02	5,707.09	5,559.38
Processing Net Revenue	2,651.49	2,418.62	2,335.77
Total Industry Net Revenue	8,204.51	8,125.71	7,895.15
Total Net Benefit		**(78.80)**	**(309.36)**
Farm Net Benefit		**154.07**	**6.36**
Processing Net Benefit		**(232.87)**	**(315.72)**

Figure 6.16: Net Benefit From Trade Liberalization for the Dairy Industry Under the 10-Year and 20-Year Sunset Scenarios



Farm revenue and processing revenue under the 10-year scenario and the 20-year scenario are about 1.55% higher and 1.64% lower respectively in comparison to the base scenario. Total industry net revenue, which is the sum of the net revenues at the farm and processing levels, is about 1% and 4% lower under the 20-year and 10-year sunset scenarios respectively in comparison to the base scenario. We decided to investigate which level incurred the most negative net benefits. It turned out the losses occurred at the processing level. For example, under the 20-year scenario, the net benefit at the processing level was $-233 million compared to $154 million at the farm level. This may be explained by the incomplete product line in our model at the processing level. From that perspective, one could suggest that when all products are put together, the net benefit to the dairy industry, if negative at all, may be smaller than the estimated average annual -$79 million and -$309 million under the 20-year and 10-year sunset scenarios respectively.

Thus, using the foregoing average net benefits, we calculate that over the twenty years, the cumulative net benefit for the dairy industry is -$1.578 billion and -$6.187 billion under the 20-year and 10-year sunset scenarios respectively. In this sense, it will seem that seeking a longer sunset is more beneficial to the dairy industry. However, when we consider the unaccounted for products and the fact that dairy producers experience positive net benefits under the 10-year scenario, any thoughts of seeking a longer sunset should be considered carefully.

The trend in the net benefit from trade liberalization for the two sunset scenarios is presented in Figure 6.16. The figure illustrates a broader story than the averages tell. For example, minimal net benefits accrue to the industry for the fourteen years under the 20-year sunset scenario compared to nine years under the 10-year sunset scenario. However, the levels of net benefits in each of the positive net benefit years are higher under the 10-year sunset scenario. It also shows that by the end of the simulation period, the 10-year scenario has almost turned around its negative net benefits whereas the 20-year scenario is just experiencing its worst negative net benefits.

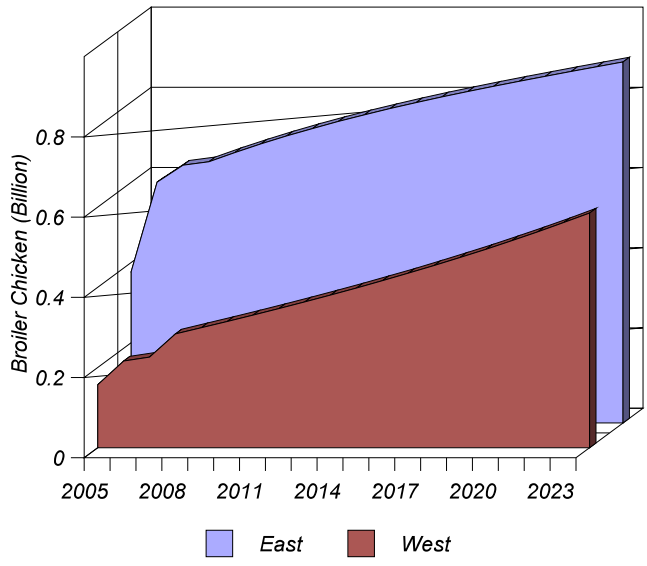
6.5 Broiler Chicken Industry

6.5.1 Base Scenario

The Canadian broiler chicken, like the dairy industry, has been attentive to changes in international trade conditions since it currently enjoys significant protection from foreign competitors in its domestic market. However, the industry has been undergoing significant policy changes over the past few years. For example, it implemented a new quota allocation in 1995 that led to a 14% increase in production. It is not difficult to understand the principal motivating factors for these changes – demand has been riding high in the industry. Given the health and other perceived benefits of chicken, consumption in Canada is projected to increase at about 1.13% per annum to reach 35 kg per capita by 2024. This projection is one of the major factors driving the chicken subsystem of the model.

Currently, the East dominates the West in chicken production. Industry watchers believe that a shift is under way as we move to a more liberalized trade environment. As with dairy, the increasing reduction in rural land due to a rapidly expanding urban region in the East, compounded by manure disposal limitations, constrains the growth in broiler chicken expansions in the East. Furthermore, it is believed that the emergence of higher nutritional-content feed grains (e.g., Canadian Prairie Spring Wheat) will improve the cost-attractiveness of the West.

Figure 6.17: Distribution of Chicken Under the Base Scenario



The projected distribution of chicken production between Western and Eastern Canada is presented in Figure 6.17. It shows that the proportion of chicken produced in the West increases from about 29% to 39% over the period. This is more dramatic considering that production levels in the East are also increasing.

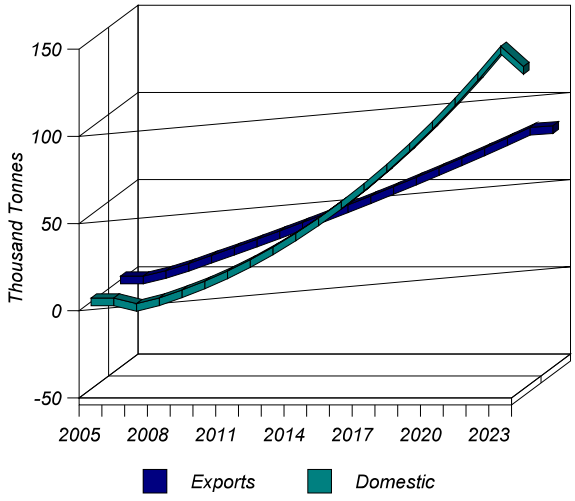
Chicken processing is assumed to benefit from improved technology over the period which

increases slaughter efficiency and conversion factors. On this basis, estimated total volume of chicken meat produced in Canada increased from about 0.8 billion tonnes to 2.54 billion tonnes between 2005 and 2024, a 207% increase under the base scenario. This, it is believed, is possible because the industry takes advantage of the increasing domestic demand and emerging export opportunities. Total domestic use increases by 198% from 750,000 tonnes to 2.19 million tonnes while exports increase from 78,000 tonnes to 349,000 tonnes, or by 348%. It is estimated that the Canadian poultry primary processing industry is currently operating at about 55% of its capacity. This implies that for it to be able to capitalize on future opportunities, will require significant investment in processing. With current production at about 730,000 tonnes, processing capacity will need to increase by 162% to process the projected production in 2024. Also, the projected total consumption of chicken in 2024 is about 1.43 million tonnes, based on a projected per capita consumption of about 35.6 kg. This implies that with total domestic chicken production of 2.5 million tonnes in 2024, the industry's further processing operations must be capable of processing the extra one million tonnes into further processed high value-added products for both international markets. We do not know the extent of the further processing capacity in the country. However, anecdotal information indicates that the rate of further processed chicken products on the market has been increasing exponentially over the past decade or so. Restaurants and home-meal replacement products are taking advantage of the *flexibility* of chicken. The foregoing implies the need for increased investment in both primary processing and further processing. Industry experts pointed to such initiatives already being under way in the West.

6.5.2 20-Year Scenario

Like dairy, the chicken industry's tariffs become ineffective after some time and prices begin to drop. Under such circumstances, we observe a response to declining prices by producers. The incremental effect of trade policy changes for broiler chicken production in the East and West is presented in Figure 6.18. Between 2022 and 2024, there was a 6.9% decline in the East and a 2% decline in the West. On average, though, production under the 20-year scenario was up by 4% and 7% respectively in the East and the West relative to the base scenario.

Figure 6.18: Incremental Chicken Produced Between 20-Year and Base Scenarios



The distribution of incremental production of chicken meat between exports and domestic use is presented in Figure 6.19 It shows that both exports and domestic use trended upwards. At the end of the simulation in 2024, total volume produced under the 20-year scenario was 2.64 million which was 9% more than was produced under the base scenario. Between 2005 and 2024, the share of exports increased by 7% under the 20-year scenario from 9% to 16% compared to 5% under the base scenario, from 9% to 14%.

Figure 6.19: Incremental Chicken Population Between 20-Year and Base Scenarios

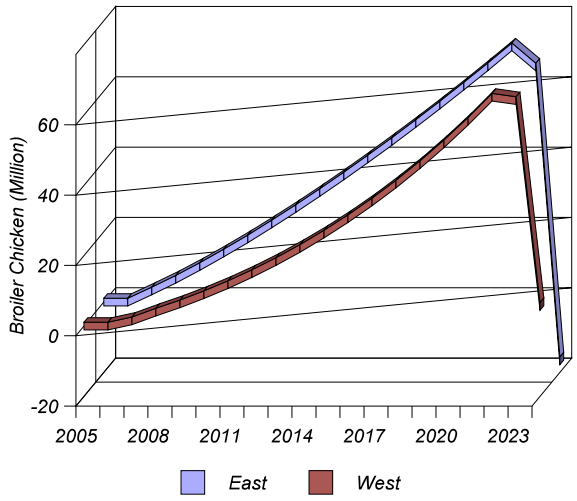
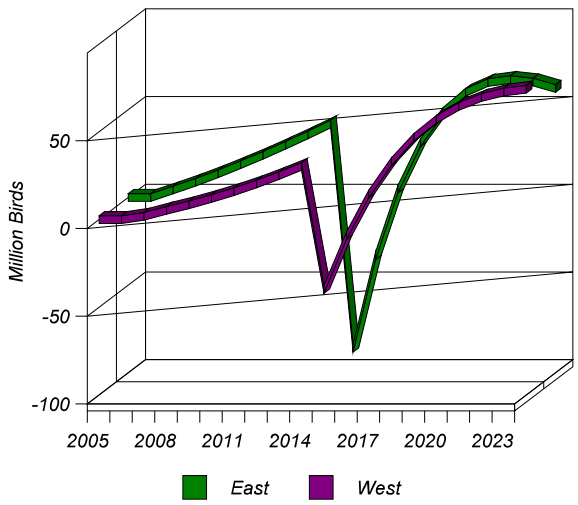


Figure 6.20: Incremental Chicken Produced Between 10-Year and Base Scenarios



6.5.3 10-Year Scenario

The incremental number of broiler chickens in Canada under the 10-year scenario with respect to the base scenario is presented in Figure 6.20. The industry's reaction to the end of the protective tariffs is illustrated by the rather substantial reductions in broilers. Despite this, by the end of the simulation period, the West's production accounted for about 41% of total Canadian production, having increased from 29% at the beginning of the simulation. In relative terms, the average boiler chicken population in the country under the 10-year scenario increased by 4.2%, with an increase of 3% in East and 6% in the West.

When tariffs have been completely removed, domestic prices decline significantly to *world price* levels, leading to the response seen in the figure. It is important to note that this decline may be a result of the attrition affecting inefficient producers operating under the current system. As price bounces back up, production begins to respond, but as stated earlier, the West begins to seize an increasing share of production.

The question of quota values also needs to be addressed for the chicken industry as we move into a more liberalized trade environment. In addition, industry observers point to increasing farm sizes to reap scale efficiencies. These issues are not the focus of this research, however, since this research provides a foundation for future conversations, we believe they should at least be, highlighted.

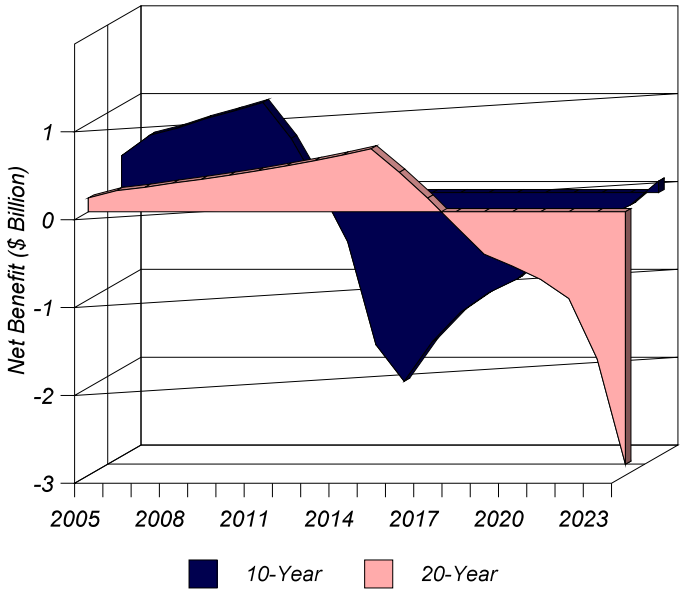
6.5.4 Net Benefit for the Chicken Industry

Table 6.4 shows the average annual revenues, costs and net revenues at each level of production and for each of the scenarios over the total simulation period. It also shows the net benefit from trade liberalization under the two sunset scenarios. On average, there was very little effect on farm revenues under the different scenarios. For example, farm revenue under the 10-year and 20-year scenarios was about 16.8% and 7.9% higher than the base scenario. However, the processing level revenue was 11.8% and 3.8% lower under the 10-year and 20-year sunset scenarios vis-a-vis the base scenario. The average annual total net benefit under the 20-year scenario was calculated as -$113 million compared to -$290 million under the 10-year scenario. Breaking the total net benefit down into its components, the table shows that farm level average annual net benefit was $147million under the 20-year scenario and $404 million under the 10-year scenario. Contrarily, processing net benefits were negative under both scenarios. These results suggest a relatively smaller reduction in farm prices due to policy changes compared to domestic wholesale prices.

Table 6.4: Summary of Average Annual Net Effects of Tariff Elimination for the Chicken Industry (Million Dollars)

Items	BASE	20-YEAR	10-YEAR
Farm Revenue	2,789.83	3,011.12	3,258.64
Processing Revenue	5,489.66	5,283.92	4,841.34
Farm Cost	1,492.23	1,566.36	1,556.20
Processing Cost	1,128.83	1,182.85	1,175.15
Farm Net Revenue	1,297.60	1,444.76	1,702.44
Processing Net Revenue	4,360.83	4,101.07	3,666.19
Total Industry Net Revenue	5,658.43	5,545.83	5,368.63
Total Net Benefit		**(112.61)**	**(289.81)**
Farm Net Benefit		**147.16**	**404.84**
Processing Net Revenue		**(259.77)**	**(694.65)**

Figure 6.21: Net Benefit From Trade Liberalization for the Chicken Industry Under the 10-Year and 20-Year Scenarios



The expected cumulative net benefit for whole 20 years of the simulation is -$2.25 billion and -$5.8 billion under the 20- and 10-year scenarios. However, if taken from the producer point of view, then the cumulative net benefits are in the order of $2.94 billion and $8.1 billion under the 20- and 10-year scenario respectively.

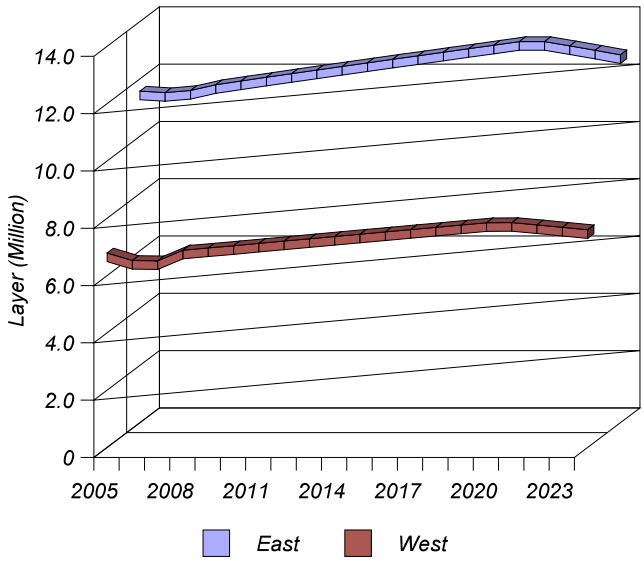
The trend in the net benefit from trade liberalization for the two sunset scenarios is presented in Figure 6.21. The figure shows the extent of tariff reduction effects on the chicken industry under the two scenarios. The figure shows that the negative net benefit under the 10-year scenario starts early (in 2011), peak early (2015) and begins to climb out of the negative thereafter. Hence, the decline in net benefit under the 10-year scenario lasts only five years. On the other hand, the 20-year scenario's net benefit begins its decline in 2015 and continues until the end of the simulation, without any indication of a turn around. Another observation is that the "trough" of the net benefits under the 10-year scenario was -$3.4 billion compared to -$4.5 billion at the "trough" under the 20-year scenario, which of course may not be the bottom of the trough since we do not simulate beyond 2024. The implication of these trends is that, although the 10-year scenario presents a higher average annual negative net benefit, its recovery is swift compared to the drawn out adjustments that the industry undergoes with the 20-year scenario. There is a need for further analysis of the effect of these adjustments on the rate of attrition and the long-term competitiveness of the industry.

6.6 Egg Industry

6.6.1 Base Scenario

Per capita consumption of shell eggs has been decreasing in Canada but the breaker egg industry has been experiencing growth (AAFC, 1996). This growth is a result of increased demand from bakeries and other confectioneries as well as hotels, institutions and restaurants. We assume that the increased liberalization of trade could increase the level of exports for eggs and egg products. Additionally, increased access to new markets for the confectionery, bakery and other such industries that use significant quantities of eggs should increase the domestic utilization of eggs. This leads us to assume that total egg exports will increase from 16% of total production to 25% by the end of the simulation period. We assume layer productivity increases from 285 eggs/year to 300 eggs/year. We use historical growth rates in the industry to project growth in layer populations. Egg prices used are the weighted blended price of shell and breaker eggs, taking data used in baseline projections by Agriculture and Agri-Food Canada and the USDA.

Figure 6.22: Distribution of Layers Under the Base Scenario



The egg production unit used in this research is laying hens. Statistics Canada data indicated that at the end of 1997, the West accounted for 37% of total layers in Canada. The projected distribution of layers

between East and West over the simulation period under the base scenario is presented in Figure 6.22. At the Uruguay Round rate of tariff reduction, and using a US reference blended price, the Canadian tariffs become ineffective in 2022. Given the direct price elasticity of supply, egg producers respond accordingly by reducing their operations. It is instructive to think of the reduction in the number of layers from the perspective of farmers leaving the industry due to inability to cover costs instead of every producer reducing their layer populations.

Egg production peaked at 520 million dozen in 2022 from 425 million dozen in 2026. Export proportion increased from 16% to 25% between 2005 and 2024, almost doubling in volume from 68 million dozen to 120 million dozen.

6.6.2 20-Year Scenario

The incremental effects of trade policy changes for layers and egg production under the 20-year scenario are presented in Figure 6.23 and Figure 6.24. The figures show a decrease of about 24% and 21% by 2024 in layer population and egg production in both Eastern and Western Canada compared to the same period under the base scenario. On the other hand, comparing the end of the 20-year scenario to the beginning of the base scenario reveals a less dramatic effect of tariff elimination.

Figure 6.23: Incremental Layer Population Between 20-Year and Base Scenarios

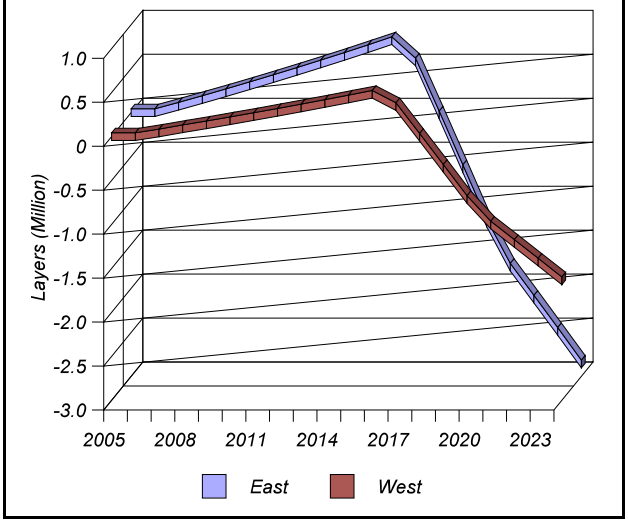
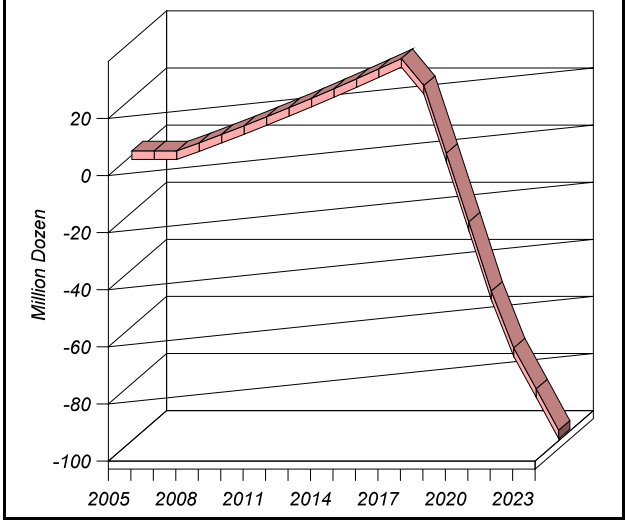


Figure 6.24: Incremental Eggs Produced Between 20-Year and Base Scenarios



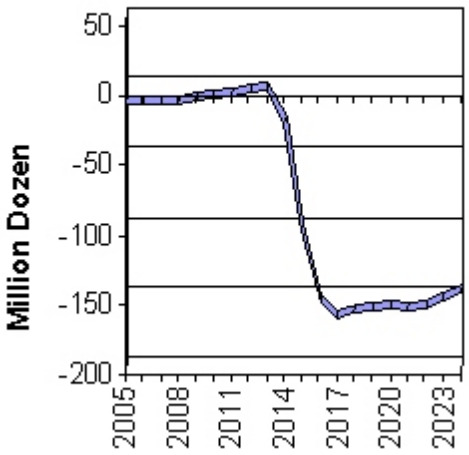
Egg production in 2024 under the 20-year scenario is only 6% less than production in 2005 under the base scenario. Similarly, layer population in Eastern Canada is 15% less than the initial population in 2005 and that of Western Canada is 12% less. Thus, from the perspective of attrition, it may seem that total egg production does not change significantly as a result of a 20-year sunset being placed on all agri-

food tariffs. Despite these reductions in layer population, total exports are projected to increase by 39% by the end of the 20-year scenario compared to the beginning of the base scenario.

6.6.3 10-Year Scenario

The incremental number of layers in Canada under the 10-year scenario with respect to the base scenario is presented in Figure 6.25

Figure 6.25: Incremental Eggs Produced Between 10-Year and Base Scenarios



The rate of decline under the 10-year scenario increases vis-a-vis the 20-year scenario, but the industry also begins recovery before the simulation is over. The total number of layers falls to about 8.6 million and 4.9 million in the East and the West respectively in 2015. Beyond this time, the numbers begin to creep up, reaching 9.7 million and 5.6 million in 2024. Compared to the initial point under the base scenario, these populations are equivalent to a 15% reduction. Egg production at the end of the simulation is down 12% from its initial levels but exports are up by 30%.

As with other supply managed products, the egg industry has to deal with the questions about quota value treatment as we move to a liberalized trade environment. The foregoing suggests that rationalization in terms of the total volume of egg production and numbers of layers may be small, yet we did not evaluate the potential rationalization that will occur in terms of the number of producers. This question has to be addressed. The proportion of producers whose production costs are low enough to allow them to survive in a liberalized trade environment that causes domestic prices to move towards world prices must be determined. This will provide the industry with some indication of the potential rate of attrition among producers.

6.6.4 Net Benefit for the Egg Industry

Table 6.5 shows the average annual revenues, costs and net revenues for the egg industry for each of the scenarios over the total simulation period. It also shows the net benefit from trade liberalization under the two sunset scenarios.[14] For example, average annual farm revenue under the 10-year and 20-year scenarios was respectively 24% and 8% less than it was under the base scenario.

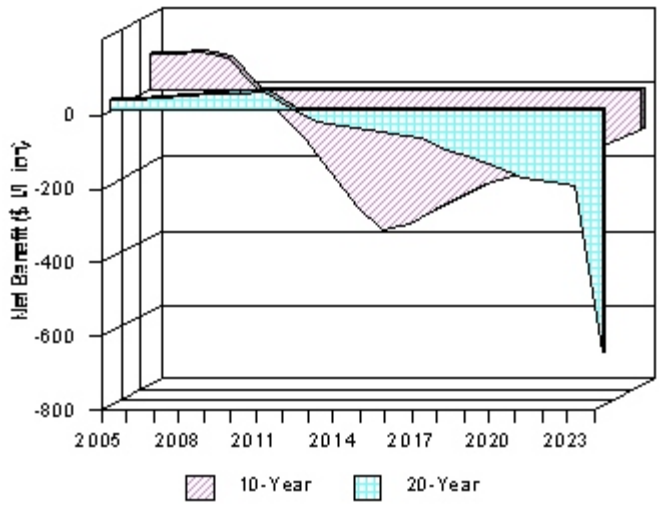
[14] Egg processing is defined to encompass breaking and the shell segments of the industry.

Table 6.5: **Summary of Average Annual Net Effects of Tariff Elimination for the Egg Industry (Million Dollars)**

Items	BASE	20-YEAR	10-YEAR
Farm Revenue	712.50	657.86	544.22
Processing Revenue	878.10	803.48	661.11
Farm Cost	257.79	249.58	216.23
Processing Cost	819.38	756.53	625.85
Farm Net Revenue	454.71	408.27	327.99
Processing Net Revenue	58.73	46.95	35.25
Total Industry Net Revenue	513.44	455.22	363.25
Total Net Benefit		**(58.21)**	**(150.19)**
Farm Net Benefit		**(46.44)**	**(126.72)**
Processing Net Revenue		**(11.78)**	**(23.47)**

The average total net benefit was negative $58 million and negative $150 million under the 20-year and 10-year scenarios respectively. The table shows that, unlike the chicken and dairy industries, both producers and processors had negative net benefits. Furthermore, the farm level had higher absolute net benefits, implying that most of the *cost of trade liberalization* is incurred at the farm level. For example, the farm level accounted for more than 84% of the total negative net benefit under the 10-year scenario.

Figure 6.26: Net Benefit From Trade Liberalization for the Egg Industry Under the 10-Year and 20-Year Scenarios



The trend in the net benefits under the two sunset scenarios is presented in Figure 6.26. The figure shows that positive net benefits peak at $12 million in 2009 under the 10-year scenario, descending thereafter and bottoming out at -$378 million in 2014. This is so because the egg tariff becomes ineffective very early in the simulation due to the price level in the US (the principal competing country). It begins to climb out of the bottom thereafter. In the case of the 20-year scenario, the positive benefits peak at $51 million in 2011, and then begin a slow descent to -$655 million dollars net benefit in 2024. While the industry is almost out of its negative net benefit situation by the end of the simulation under the 10-year scenario, under the 20-year scenario, net benefits are just hitting their bottom level of -$600 million at that point.

The foregoing may also be looked at from the perspective of the opportunity cost of negotiating a 10-year sunset versus a 20-year sunset. Given the fact that tariffs are going to continue downwards, the question that really remains is when they get to zero. From that perspective, it may be useful for the industry to initiate strategies that minimize the negative effects of the adjustment period that has been shown here, and seek ways of augmenting its opportunities.

6.7 Grain Industry

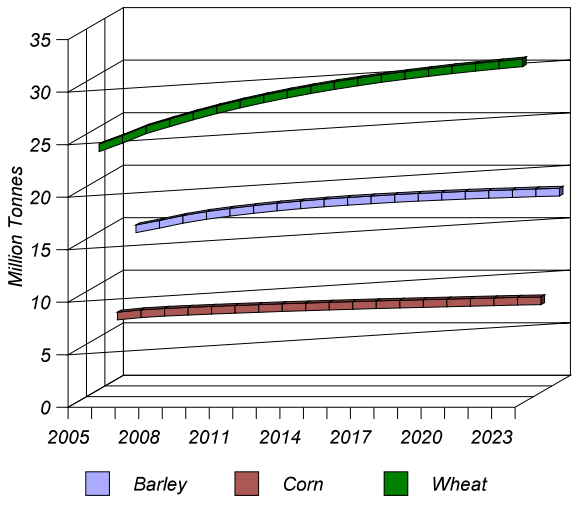
The grains considered in this research are wheat and barley in the West and corn in the East. There are three outlets for grain produced in Canada: livestock use, industrial use and exports. We determined the average requirements per livestock industry in the model to estimate total livestock requirements. Since not all livestock is included in the model, the quantity of livestock used for grain is underestimated. Industrial use accounts for all non-livestock use in the domestic market. Exports are the residual after accounting for livestock and industrial uses. Thus, unlike the livestock industries' component of the model, where a certain degree of heterogeneity is allowed and exports occur even when domestic needs are not met by production, the grain industries' exports occur only when all domestic needs have been met.

The principal assumption in this segment of the model is that, although farmers use some of their grain on farms for their livestock, total production is assumed sold, and counted in the industry's revenue estimation. Also, production is dependent on acreage which is determined by own and cross prices. Acreage for each of the three Western crops (barley, wheat and canola) is influenced by all three crop prices while the acreage for each of the two Eastern crops (corn and soybeans) is determined by corn and soybean prices. The initial yields for wheat, barley and corn, based on Statistics Canada data, are respectively 2.1 tonnes, 2.9 tonnes and 6.9 tonnes per hectare. Final yields were assumed to be 2.8 tonnes, 3.5 tonnes and 7.5 tonnes respectively. These assumptions were based on historical growth rates as well as conversations with industry watchers about their expectations regarding technological developments in yields.

6.7.1 Base Scenario

Projected production of the grain crops included in this research is presented in Figure 6.27. There was a 24% increase in total barley production over the 20 years compared to 20% for corn and 33% for wheat. In terms of acreage use, both wheat and barley acreage increased by only 4% while corn increased by 12%. Therefore, the growth in production is more a result of technology and yield improvement than acreage expansion. Barley yield, for example, increases by 20% over the period, while corn yield increases by 8%.

Figure 6.27: Projected Grain Production Under Base Scenario



Data limitations did not allow us to model the different types of wheat, but conversations with industry leaders pointed to some of the reasons for the projected trends. Discussions with

industry experts revealed that they expect an accelerated shift away from traditional Hard Red Spring wheat to Canadian Prairie Spring (CPS). This is mainly because CPS has greater potential as livestock feed and also has a higher yield. Thus, given the expected increases in livestock populations in the West and the attendant need for feed grains, the increase in CPS wheat makes sense. This does not, however, imply the complete elimination of Hard Red Spring wheat but it will increasingly become a niche market product. It is also expected that Durum wheat would continue to have growing potential as both (food) wheat and value-added food exports increased.

Barley is going to be increasingly important in the agri-food economy in Western Canada because of its principal role as a livestock feed. Some industry watchers believe that it could be the bottleneck in the projected growth of livestock production in the region. Also, competition from industrial uses is going to put pressure on demand, exacerbating the bottleneck barley poses to growth in the livestock industries. Growth is increasing rapidly with expansions in ethanol and high fructose corn syrup production in Ontario. Corn is in a net import position throughout the simulation period.

Figure 6.28: Projected Barley Exports and Domestic Use Under the Base Scenario

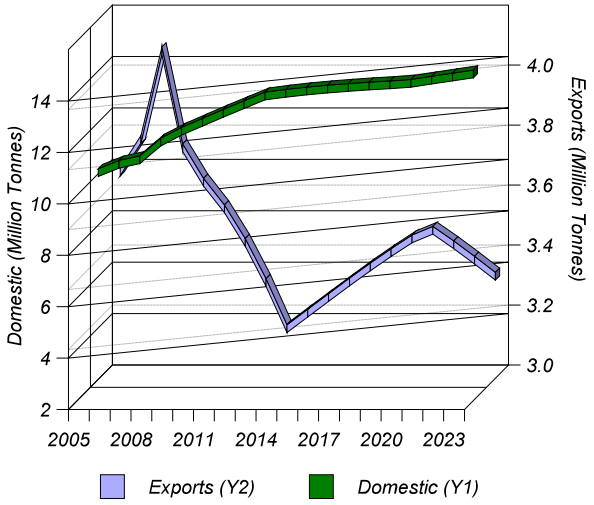


Figure 6.29: Projected Wheat Exports and Domestic Use Under the Base Scenario

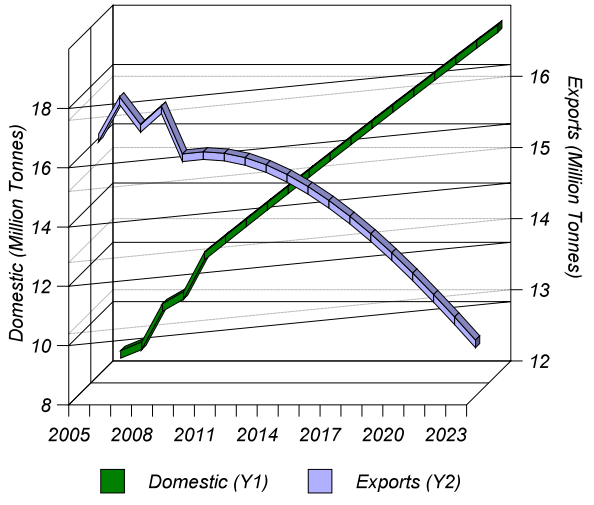


Figure 6.28 and Figure 6.29 show the projected trends in domestic use and exports for barley and wheat. The rationale for the trends is an increase in domestic use of the raw commodities in higher value production as well as livestock use. For example, the proportion of livestock use in the total domestic wheat doubles over the simulation period while that for barley livestock requirements exceeded availability, implying the need to import, by 2023. Given the expected competition from industrial uses, we think the deficit situation in barley may occur earlier than projected. For example, an ethanol plant is scheduled for operation in 1999 in Alberta, and this should draw a significant amount of barley from other users such as livestock and exports.

It is expected that Canada will be shipping more wheat in the form of pasta, bagels and fine confections

made from wheat flour than before, increasing the relative proportion of high value-added consumer-ready products made from wheat. The implicit assumption in this expectation is that the appropriate investments will be made to ensure the development of high value-added products. This has been occurring in Western Canada. The western Canadian food processing sector grew by more than $2.5 billion (or just over 20%) between 1993 and 1996. Exports accounted for more than $1.1 billion (or 45%) of all shipment increases (Canada West Foundation, 1997). In fact, western Canadian agri-business is the most export-oriented region of the country and has been moving away from its traditional commodity-only orientation towards increased diversification and value-added processing. It is estimated that Alberta's agri-food sector, for example, grew at a rate of around 8.9 percent between 1992 and 1998 and that to reach the province's target of a sector worth $20 billion by the year 2005, future growth rates will need to be more than 12 percent per year (AAFRD, 1998). The provincial government has consciously created an environment that supports such growth by, among other things, committing resources to research and development activities in value-added agriculture. The role of government in ensuring the continued development and trade in high value agri-food products will become more imperative as the need intensifies for specialty products and food components tailored to specific customers and markets.

Discussions with industry stakeholders revealed a number of visions for the future of value-added agri-food exports. For example, rather than shipping malt barley, Canada might eventually ship wort syrup for use in beer-making - a lower volume of exports but of significantly higher value. Developments in wheat fractionation will see exports of wheat gluten, proteins etc. to specific end-users. As the projections in the above figures show, these initiatives will not completely replace commodity-type wheat and barley (and other crops) exports but presents a promising market opportunity for high-value exports.

These developments also alter the way we think about agri-food products and trade. In the future, rather than measuring exports along traditional commodity lines, crop by crop (X tonnes of wheat, X tonnes of barley, etc.), it will become more meaningful to measure export trade in terms of the "components" of a crop exported – exports of fibre, protein, oils, gluten, etc. We will need different data and data collection processes to successfully track these developments.

6.7.2 20-Year Scenario

The elimination of tariffs increases the ability of Canada's agri-food industries to enhance their international competitiveness. In this section, we evaluate the incremental effects of a tariff sunset for agri-food on the Canadian grain industry. Figures 6.30 and 6.31 show these changes for barley and wheat respectively between the 20-year and the base scenarios. In both cases, we observe that production and domestic use are increasing while exports are decreasing under the 20-year scenario vis-a-vis the base scenario. For example, barley and wheat exports declined by about 400,000 tonnes by 2024 while production increased by about 100,000 tonnes. With respect to the 20-year scenario, total domestic use for barley increased by 39% and production by 25% while exports decreased by 18% between 2005 and 2024. For wheat, domestic use increased by 94%, with livestock use more than

doubling over the period, while exports remained unchanged and production increased by 34% between 2005 and 2024. Corn under the 20-year scenario experienced similar increases in acreage and production. However, since livestock numbers also increased, the net import scenario for corn does not change. As a matter of fact, under the 20-year scenario, total corn imports increased every year from 2007 till 2024, reaching a high of 1.55 million tonnes in 2022.

Figure 6.30: 20-Year Scenario Wheat Production, Exports and Domestic Use Compared to the Base Scenario

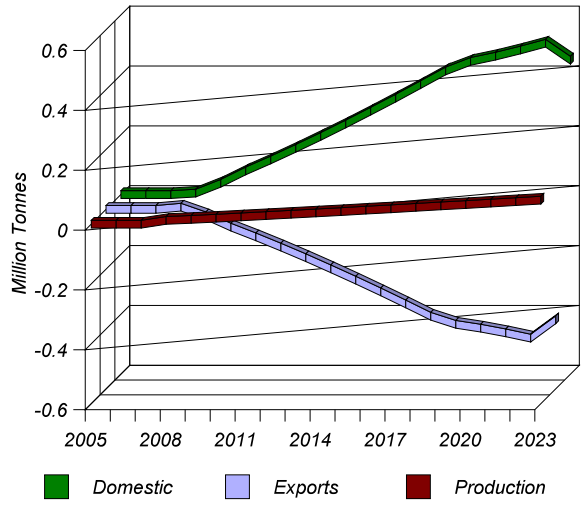
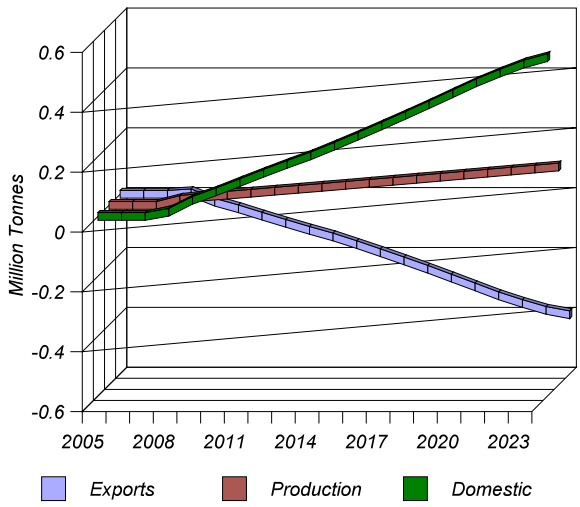


Figure 6.31: 20-Year Scenario Barley Production, Exports and Domestic Use Compared to the Base Scenario

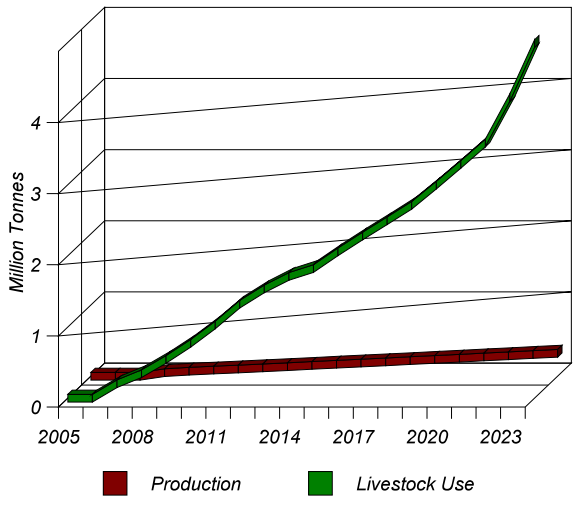


6.7.3 10-Year Scenario

The trends for domestic use, exports and production under the 10-year scenario are similar to that presented in the previous subsection. Therefore, we present the incremental livestock use for feed barley in Figure 6.31. The figure shows about 4.9 million tonnes more barley required by the livestock sector relative to the base case by 2024. This was equivalent to a 59% increase in barley for livestock use between 2005 and 2024.

The increase in production under the 10-year scenario vis-a-vis the base scenario in 2024 is 1.8%, although over the whole period (2005 to 2014), the increased barley production was 26%. Our belief is that the direct price elasticity of supply for barley under the

Figure 6.32: 10-Year Scenario Barley Production and Livestock Use Compared to the Base Scenario



10-year scenario will be significantly higher than the 0.9 suggested by industry leaders and the competition for barley between industrial users and livestock use could lead to higher production or higher prices or both. As indicated earlier, we should expect to see barley imports towards the end of the simulation period if the assumed conditions of direct price elasticity and prices are maintained as in the model.

6.7.4 Net Benefit for the Grains Industry

Table 6.6 shows the average annual revenues, costs and net revenues for the wheat, barley and corn industries for each of the scenarios over the total simulation period. It also shows the net benefit from trade liberalization under the two sunset scenarios for each crop as well as the total grain net benefit.

Table 6.6: Summary of Average Annual Net Effects of Tariff Elimination for the Grain Industry (Million Dollars)

Barley	BASE	20-YEAR	10-YEAR
Farm Revenue	2,176.62	2,262.26	2,419.53
Farm Cost	830.59	833.80	838.65
Export Revenue	689.42	673.53	693.18
Export Barley Cost	448.12	437.80	450.57
Net Revenue	1,587.33	1,664.20	1,823.49
Barley Net Benefits		***76.87***	***236.16***
Corn			
Farm Revenue	1,313.91	1,340.93	1,394.30
Farm Cost	623.91	624.24	624.57
Net Revenue	690.00	716.69	769.73
Corn Net Benefits		***26.69***	***79.73***
Wheat			
Farm Revenue	5,058.77	5,167.98	5,462.21
Farm Cost	2,088.61	2,091.59	2,097.56
Export Revenue	3,763.21	3,797.56	4,007.01
Export Wheat Cost	2,709.51	2,734.24	2,925.11
Net Revenue	4,023.86	4,139.71	4,446.55
Wheat Net Benefits		***115.85***	***422.69***
Total Grain Net Benefit		**219.41**	**738.58**

Average annual barley farm revenue under the 10-year and 20-year scenarios was respectively 11.2% and 4% higher than that under the base scenario. Barley net benefit under the 10-year scenario was an average of $236 million per annum. Taking this over the 20-year span implies a total net benefit of $4.72 billion. Likewise, the barley net benefit under the 20-year sunset scenario was $77 million per annum or $1.54 billion over twenty years.

Corn average annual net benefits are not as large as for barley but they are still significant. Under the 10-year scenario, the cumulative net benefit for corn over twenty years is more than $3.2 billion compared to $1.075 billion under the 20-year scenario. The average annual wheat net benefit was $116 million and $423 million under the 20-year and 10-year scenarios. The cumulative net benefit under the two scenarios for wheat between 2005 and 2024 was $2.32 billion and $8.45 billion respectively.

Total cumulative net benefit for the grain sector included in the model was $4.39 billion under the 20-year scenario and $14.77 billion under the 10-year scenario for the total simulation period of twenty years. The distribution of the 10-year total cumulative net benefit was as follows: Wheat (57%); Barley (32%); and Corn (11%). Under the 20-year scenario, the distribution was as follows: Wheat (53%); Barley (35%); and Corn (12%).

An implicit assumption of the model is that domestic processing capacity will increase to accommodate the increased production emanating from policy changes. Therefore, to succeed in achieving the estimated net benefits presented here, these grain industries should be prepared to make the necessary investments required to increase their ability to process the increased proportion of production that is use in the domestic market.

6.8 Oilseed Industries

The oilseed industries included in this research are canola and soybean. Unlike the grains' industries, but like the livestock industries, primary processing information was available, allowing us to estimate a first level net benefit for the processing segment in these industries. Thus, we estimate the production of these oilseeds and distribute it between commodity exports and domestic processing into oils and meals. These products are also distributed between the domestic and export markets.

Like other crops, acreage is determined by own and competitor product prices as well as direct and cross-price elasticities of crops that compete for the same land. Hence, canola acreage, in addition to canola price and direct price elasticity, is determined by wheat and barley prices and cross-price elasticities. The initial yields for canola and soybeans, based on Statistics Canada data, were 1.4 and 2.6 tonnes per hectare, increasing at a decreasing rate to 1.9 and 3.2 tonnes respectively. These are equivalent to 36% and 23% respectively over 20 years. These limits to yield are based on interviews with industry leaders.

We believe these growth rates are very conservative, especially when viewed from the perspective that improvements in oilseeds may come from quality and better use of components instead of improvements in yields. In light of this, we might even see yields go down or remain static but see a significant increase in value due to special characteristics of the crops. For the purposes of this study and because of the inherent difficulties in predicting future technological developments, however, we do not attempt to capture this probable improvement in product quality. Instead, we treat oilseeds as homogeneous commodities responding to yield improvements over time.

6.8.1 Base Scenario

Projected production of the oilseed crops included in this research is presented in Figure 6.32. Total soybean and canola production increased by 23.5% and 45% respectively between 2005 and 2024. Total tonnage of canola and soybeans at the end of the simulation period was more than seven million tonnes and 2.8 million tonnes. The acreage expansion supporting these increases was 11.7% for canola and 2%

for soybeans. Hence, like grains, significant improvement in production is occurring from technology and not necessarily from acreage expansion.

Figure 6.33: Projected Oilseed Production Under Base Scenario

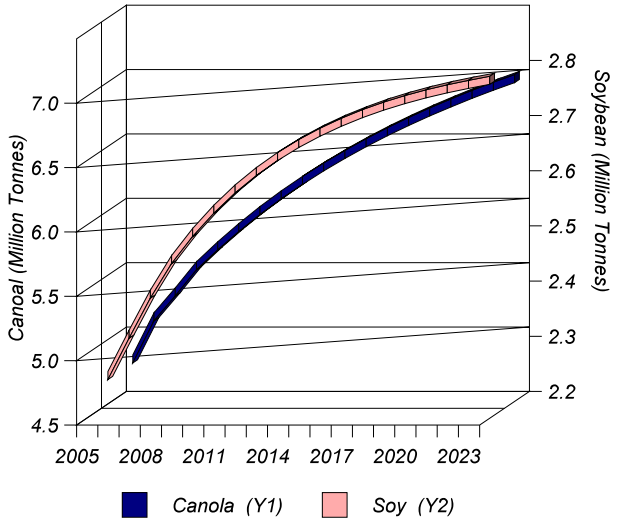
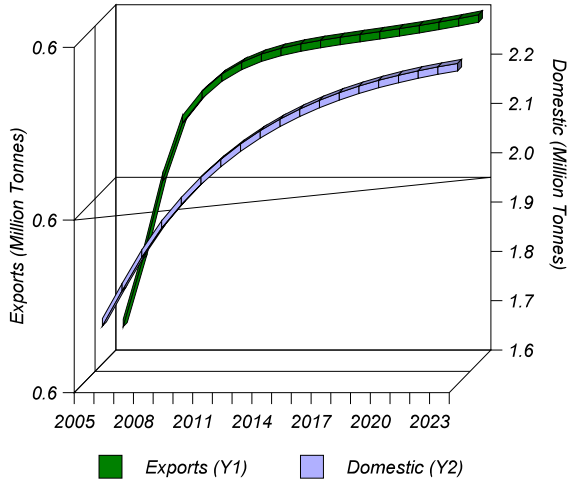
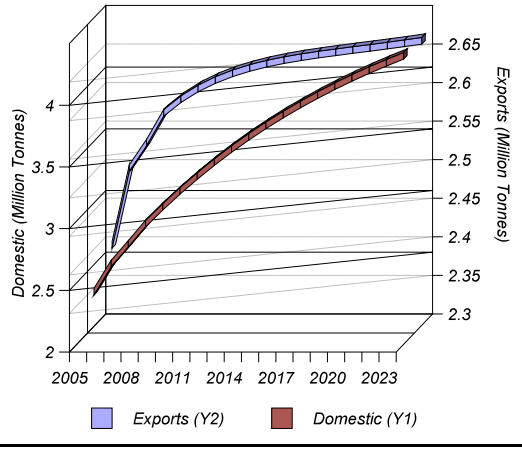


Figure 6.34: Projected Soybeans Exports and Domestic Use Under the Base Scenario



There have been rapid expansions in Canada's oilseed crushing industry over the past decade (Agriculture and Agri-Food Canada, 1996). It was estimated by Agriculture and Agri-Food Canada that total crushing capacity was 4.9 million tonnes in 1996, and more than 67% of this is dedicated to canola and other western oilseeds such as flaxseed and sunflower seed. The expectation is that reductions in tariffs, which tend to be higher on processed products, is going to increase the volume of oilseeds crushed in Canada.

Figure 6.35: Projected Canola Exports and Domestic Use Under the Base Scenario



Soybean exports and domestic use are presented in Figure 6.34. At the end of the simulation period, total domestic use (for processing) has increased by 30% to about 2.2 million tonnes while soybean exports have only increased 3%. This level of domestic soybeans exceeds current processing capacity, implying the need to make the necessary expansions if the industry is to take advantage of the lower or zero tariffs and resulting market access opportunities.

A similar picture emerges for canola (Figure 6.35) except that the amount of canola available for domestic processing increases by 79% between 2005 and 2024, equivalent to about 4.3 million tonnes. Thus, canola processing capacity moves from operating at 74% capacity in 2005 to requiring an extra 31% capacity by 2024.

Industry experts point to the increasing oilseed crushing capacity in Japan, the US and Mexico. These expansions are supported by strong opportunities for this industry – from traditional uses for food to new uses in automobiles and aeroplanes and emerging nutraceutical and medical uses. The expectation is that increased demand for seed will put an upward pressure on canola prices in the long run. This could imply that our price and production projections may be underestimated. If this happens, then the economic foundation exists for the domestic processing industry to expand. The upward pressure on oilseed prices suggests that producer response may be stronger than assumed in this study.

We assumed a yield rate of 79% for soybean meal and 16.5% for soybean oil. For canola meal, the assumed yield rate was 57% while the yield rate for canola oil was allowed to increase from 41% to 45% over the simulation period on advice from industry watchers. The other rates were obtained from *Production, Supply and Disappearance* (USDA/ERS).

Figure 6.36: Projected Canola Products Exports and Domestic Use Under the Base Scenario

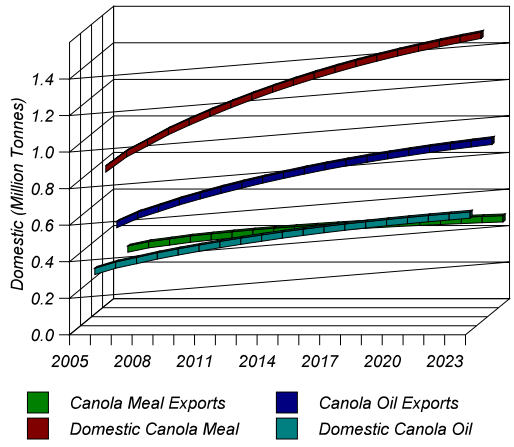


Figure 6.36 shows the projected distribution of production of canola oil and meal between domestic use and exports. As expected, meal was used more heavily by the domestic market while a large proportion of oil produced was exported. The proportion of meal used in the domestic market increased from 73% to 77% as livestock populations increased. This implied a reduction in the proportion of meal produced that was exported.

The trend for soybeans was different, in that larger proportions of both oil and meal were exported. The average annual soybean oil and meal exports were about 98% and 86% of total production over the 20-year simulation period. A similar trend was seen in both products for soybeans.

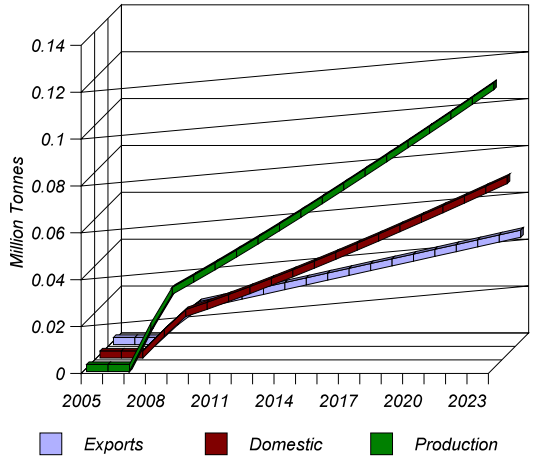
6.8.2 20-Year Scenario

The increase in production, domestic use and exports for canola between the 20-year sunset scenario and the base scenario is presented in Figure 6.37. It shows that increases in production were accompanied by increases in both domestic use and exports. Production increased by 120,288 tonnes or 48% by 2024 and exports increased by 97% relative to 2005.

The situation was not very different for soybeans, which yielded an increase in production of just 5,317 tonnes under the 20-year scenario vis-a-vis production in the base scenario. Thus, the 20-year scenario does not generate significant changes in production (and processed products) compared to the base scenario. We may attribute this to the fact that producer response to tariff changes between the 20-year and base scenarios is not very different. For example, direct price elasticity for soybeans was 0.35 under

the base scenario compared to 0.37 under the 20-year scenario because industry leaders did not expect a strong shift in behaviour due to a 20-year sunset. If supply response should increase significantly vis-a-vis the base scenario, then we should expect larger increases in production. Given that we believe there is going to be an increase in new uses and new products for the oilseed industries, this suggests that tariffs are not going to be the principal drivers of change in the industry.

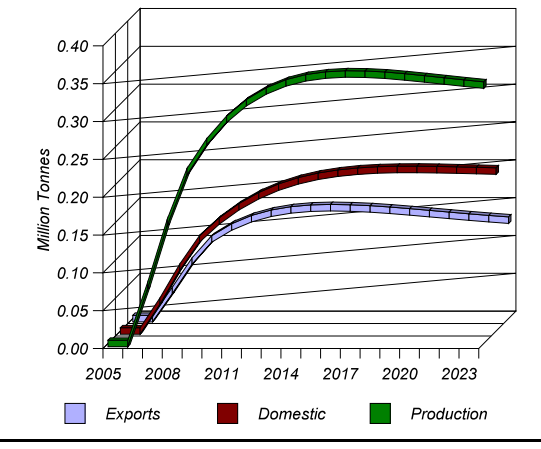
Figure 6.37: 20-Year Scenario Canola Production, Exports and Domestic Use Compared to the Base Scenario



6.8.3 10-Year Scenario

Soybean and canola production under the 10-year scenario increased marginally vis-a-vis the base scenario, primarily because of the assumptions about producer response to tariff changes. Figure 6.38 shows the projected increasing trends for canola production, exports and domestic use. The incremental production peaks at almost 350,000 tonnes over and above the base scenario and stabilizes relative to the base scenario. Total production under the 10-year scenario increases by 52% over the period, from 4.83 million tonnes to 7.35 million tonnes. Taking out the exports of 2.8 million in 2024, this leaves 4.55 million tonnes for domestic processing. This level of canola seed is equivalent to about 38% more than the current available processing capacity. This points to the need for a concerted effort on the part of the industry to make the necessary investments in processing capacity.

Figure 6.38: 10-Year Scenario Canola Production, Domestic Use and Exports Compared to the Base Scenario



We believe that our assumptions about producers response are very conservative.[15] This makes the current processing capacity very tenuous as we move into a more liberalized trade environment where canola and soy products gain improved access to the international market. That is, production response to trade policy changes may be higher than assumed in this study.

[15] The section on sensitivity analysis confirms this belief, where we significantly increase the direct price elasticity for producers in the sunset scenarios and the incremental results in production and associated activities increase exponentially.

6.8.4 Net Benefit for the Oilseed Industries

Table 6.7 shows the average annual revenues, costs and net revenues for canola and soybean industries for each of the scenarios over the total simulation period. It also shows the net benefit from trade liberalization under the two sunset scenarios for each crop as well as the total oilseed industry net benefit.

Table 6.7: Summary of Average Annual Net Effects of Tariff Elimination for the Grain Industry (Million Dollars)

Canola	BASE	20-YEAR	10-YEAR
Farm Revenue	2,411.99	2,529.74	2,753.19
Export Revenue	1,122.28	1,176.61	1,280.14
Export Canola Cost	1,010.06	1,058.95	1,152.12
Domestic Meal Revenue	249.07	261.32	284.48
Domestic Oil Revenue	364.10	387.95	422.34
Export Meal Revenue	87.40	91.68	99.78
Export Oil Revenue	1,556.00	1,669.09	1,898.81
Farm Cost	598.74	637.97	694.52
Farm Net Revenue	1,813.24	1,891.78	2,058.67
Processing Net Revenue	1,240.52	1,322.68	1,480.72
Total Industry Net Revenue	3,053.76	3,214.45	3,539.40
Net Benefit		***160.70***	***485.64***
Soybean			
Farm Revenue	854.06	876.40	907.86
Export Revenue	202.31	207.60	215.04
Export Soy Cost	182.08	186.84	193.54
Domestic Meal Revenue	9.00	9.24	9.57
Domestic Oil Revenue	29.26	30.29	31.38
Export Meal Revenue	411.57	422.29	437.39
Export Oil Revenue	192.19	199.10	206.22
Farm Cost	313.02	313.36	313.87
Farm Net Revenue	541.04	563.04	593.99
Processing Net Revenue	341.24	351.22	363.78
Total Industry Net Revenue	882.28	914.26	957.77
Net Benefit		***31.98***	***75.49***
Total Oilseed Industry Net Benefit		***192.68***	***561.13***

Average annual canola farm revenue under the 10-year and 20-year scenarios was respectively 14.2% and 4.9% higher than that under the base scenario. Average annual farm net revenue under the two sunset scenarios also increased by 4.3% and 13.5% respectively. As expected, the net benefit for the processing segment of the canola industry was higher than at the farm level. It was 6.62% under the 20-year scenario and 19.36% under the 10-year scenario. Average annual net benefit under the 20-year scenario was $161 million compared to $486 million for the 10-year sunset scenario. This means that over the 20 years we conducted the simulation, the canola industry had a cumulated total net benefit of $9.7 billion under the 10-year scenario compared to $3.2 billion under the 20-year scenario.

The clear implication of this is that the industry is better off with a 10-year sunset on agri-food tariffs than a 20-year sunset. But the telling story is that it is much better off with some sunset clause

on agri-food tariffs than maintaining the tariff reduction rates of the Uruguay Round in the Next Round.

Average annual net benefits for the soybean industry were not as large as those for canola. They were only $75.5 million under the 10-year scenario and $32 million under the 20-year scenario. These translate into a cumulative total net benefit of $1.51 billion and $639.6 million respectively over the 20-year simulation. The total cumulative oilseed industry net benefit over the simulation period, therefore, is $3.85 billion and $11.2 billion for the 20-year and 10-year sunset scenarios respectively.

6.9 Summary of Net Benefits

This section presented the quantitative results of the system dynamic model evaluating the net benefits of total trade liberalization for Canada's agri-food industries. The foregoing results are not forecasts but projections of our expectations and the expectations of industry experts and stakeholders. The system dynamic model used to generate the projections depends on some very strong and clearly defined assumptions about yields, supply responses, price effects, export orientation, production capacities, populations, per capita consumption, technology, trade policies and timing. Changes in these assumptions would affect the results.

Table 6.8 presents a summary of the average annual net benefit by industry under the 10-year and 20-year scenarios. The total average annual net benefit for the selected industries is $1.11 billion under the 20-year scenario compared to $2.51 billion under the 10-year scenario. The table shows that the supply-managed industries of dairy, chicken and eggs experience negative net benefits under both scenarios. In terms of absolute negative net benefits for the supply managed industries, the dairy industry accounted for the largest share under the 10-year scenario while the chicken industry had the largest share under the 20-year scenario. This is due, primarily to the relationship between tariffs and the reference price (i.e., US price) for these products under the two scenarios.

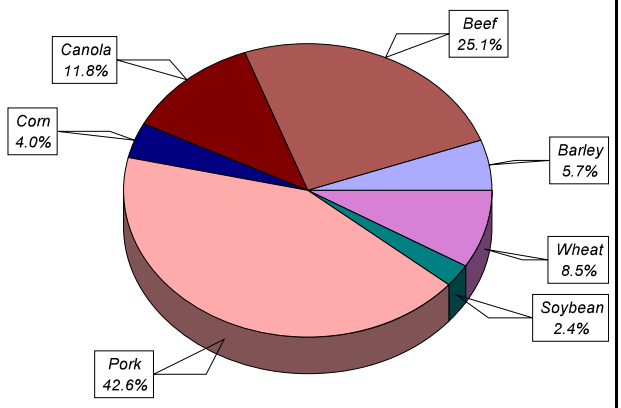
Table 6.8: Summary of Average Annual Net Benefits for Selected Industries

Industry	20-YEAR	10-YEAR
Barley	76.87	236.16
Beef	341.79	1,126.35
Canola	160.70	485.64
Chicken	(112.61)	(289.81)
Corn	26.70	79.74
Dairy	(78.80)	(309.36)
Eggs	(58.21)	(150.19)
Pork	578.88	833.77
Soybean	31.98	75.49
Wheat	115.85	422.69
Total Net Benefit	**1,082.15**	**2,510.50**

Another interesting observation emerging from the results of the model was that the processing segments of the supply managed industries all fared less well than the farm segments. For example, the average annual net benefit at the farm level for the chicken industry was only $147 million compared to -$260 million at the processing level under the 20-year scenario. Under the 10-year scenario, the farm level's average annual net benefit was positive $404 million compared to -$695 million at the processing level. The same is true for dairy, where the farm level average annual net benefit was positive $154 million and $6 million for the 20-year

and 10-year scenarios compared to negative $233 million and $316 million at the processing level.[16]

Figure 6.39: Distribution of Positive Net Benefits Under the 20-Year Scenario



The total cumulative net benefits for the selected industries are $22.18 billion under the 20-year scenario and $51.82 billion under the 10-year scenario for the period between 2005 and 2024. The distribution of the total positive net benefits is presented in Figure 6.39. It shows that the pork industry represented the largest proportion of net benefits in the agri-food sector under the 20-year scenario, followed by beef and canola.

Figure 6.40: Distribution of Positive Net Benefits Under the 10-Year Scenario

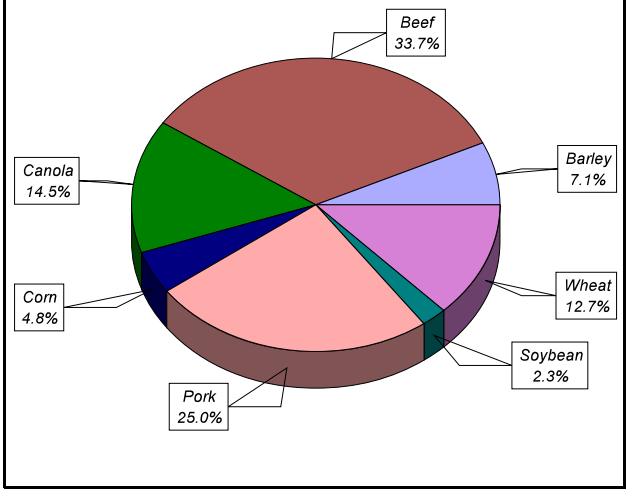


Figure 6.40 shows the distribution of total positive net benefits under to the 10-year scenario. It shows that, unlike the 20-year scenario, the beef industry represents the largest portion at 33.7%, followed by pork and canola. We believe that if we could capture the contribution of consumer-ready products in these areas, the story could be different under both scenarios. For example, baked products and confections related to the wheat industry are not included and ethanol and high fructose syrup from corn also are not included. Yet, we note the importance of the sunset horizon on the various industries' contributions to total agri-food net benefit.

What the foregoing show is that the overall net benefit to agriculture is positive despite the fact that the supply managed industries experienced negative net benefits. It also means that not undertaking these policy changes have significant costs for Canada's agri-food industries. Therefore, Canadian agri-food industries should focus on its total positive net benefits while developing strategies to minimize the negative net benefits for specific industries.

[16] It is important to recognize that we also did not include all the diverse dairy products in our analysis, focussing only on cheese.

7.1 Non-Tariff Barriers and Net Benefits from Trade Liberalization

Eliminating tariffs is only one of the major reforms that need to occur for Canada's agri-food industries to achieve the net benefits presented in the preceding section. The other policies that require attention are the non-tariff barriers and subsidies. We have described extensively the principal non-tariff barriers in Section 5.

In this section, we focus on domestic and export support programs in competing jurisdictions and quantify their effect on the net benefits for Canada's agri-food industries from liberalized international trade. We present an overview of the OECD's producer subsidy equivalents to selected countries to provide some indication of the subsidization initiatives of competitors vis-a-vis Canada's. We then conduct some experiments on the model to assess how non-compliance on the part of Canada's competitors will affect the estimated net benefits.

As we move into a more liberalized trade environment, all the countries that have experienced the benefits from trade are planning to capitalize on their past performance to enhance their global competitiveness. Many policy tools may be employed to boost the competitiveness of one's industries, but the principal ones include domestic subsidies, direct export subsidies, export market promotions and development programs, export credit and credit guarantee programs and statutory marketing boards. Although direct export subsidies have been earmarked by the WTO to decline (and every indication for the next Round is that further reductions will be sought after), there is reason to believe that with the aggressiveness of many countries in the emerging environment, new and ingenuous programs will be developed to maintain or enhance export market performance.

The section proceeds with an overview of domestic and export subsidies in important agri-food exporting countries or principal markets. We present the simulation results of the programs that we believe could have an impact on Canadian industries under the following assumptions:

1. Subsidies and other support programs are implemented by foreign countries that have industries that are important competitors to the respective Canadian industry. We assume that principal subsidy players are the EU and the US.
2. The effect of any support program in the trade environment is only important if it affects price in the domestic or international market.
3. Global tariff reductions force support to decline over time.

Schmitz, Koo and Wahl (1998) provide a theoretical and empirical foundation for the last assumption using the impact of the US Export Enhancement Program on international feed barley markets. They point out that between 1986 and 1995, approximately 88% of all feed barley exports from the US received EEP payments. Also, Canadian exports of feed barley to the US increased significantly once EEP was introduced, reaching a historic high of 1.25 million tonnes in 1993/94, a period that saw the Canadian Wheat Board temporarily lose its monopoly power over feed barley exports. Schmitz et al show that the US market would not have been attractive for Canadian exporters were it not for the high level of the EEP bonuses in that year. The point here is that in the absence of policies that prevent

importation of a product that is benefiting from lucrative export subsidies, imports of that product will increase as domestic prices rise due to shortages engendered by increased exports. It is also true that providing domestic subsidies for production of products for which domestic users (processors and/or consumers) can import much cheaply will be counterproductive in the absence of border protection. It is for these reasons that we assume that export and domestic subsidies will decline as border protection measures such as tariffs decline towards zero.

7.2 Export Subsidies

The Uruguay Round specifically required member countries to reduce their value of export subsidies by 36% and the volume of subsidies by 21% of the 1986-90 base period subsidy over the Agreement's phase-in period. The observation, thus far, is that the EU and the US, the principal users of these programs in terms of government expenditures, have been very selective in their use of subsidies. For example, the EU's export subsidies for grains have been declining but others have been fairly stable while the US has been applying its EEP on specific products to enhance its price competitiveness in specific markets. Table 7.1 illustrate the export subsidy and export promotion expenditures for selected countries and regions for the 1997 fiscal year by source of funds. Export promotion is defined to encompass advertising, trade shows, public relations, national branding, in-store and menu promotions and tasting, trade missions and reverse trade missions, export credits and technical assistance. They may be funded by government and industry together. Export subsidies, on the other hand, are funded wholly by government and involves direct expenditure to provide price competitive advantage for products produced in the subsidizing country.

Table 7.1 shows that EU spent a total of US$7.5 billion on agri-food export promotion and export subsidies, compared to US$140 million for Canada, US$177 million for Australia, US$223 million for

Table 7.1: Agricultural Export Promotion and Export Subsidy Expenditures for Selected Countries (1997) (in thousand US dollars)

Country	Export Promotion		Export Subsidy	Total
	Government Funding	Industry Funding		
US	135,020	175,663	121,462	432,145
EU	148,203	216,384	7,158,000	7,522,587
Canada	11,300	13,000	115,600	139,900
Australia	56,800	120,135	0	176,935
New Zealand	5,200	217,570	0	222,770
Switzerland	44,500	0	317,500	362,000

Source: Foreign Agricultural Service of the USDA, June 30, 1998.

New Zealand and US$432 million for the US. The breakdown shows that about 95% of the EU's total expenditure was on direct export subsidies compared to 82% for Canada and 28% for the US.

On the other hand, Australia and New Zealand's expenditures were all on export promotion. It is also observed that the government's share of total expenditures on export promotion and subsidy was much lower in Australia and New Zealand than in other places. For example, the government share of total expenditures in Canada was 90% compared to 97% in the EU, 59% in the US, 32% for Australia and 2.3% in New Zealand.

The EU's export subsidies benefited its meat and poultry industries (US$2.3 billion), dairy (US$1.9 billion), and grains (US$466 million). US export subsidies benefited such products as pork, frozen chicken, dairy products as well as wheat, wheat flour, rice, barley, barley malt, table eggs, feed grains and vegetable oil.[15]

As transparency requirements under the WTO forces reductions in direct export subsidies, it is expected that promotional and other export support expenditures will increase to enhance the industries' competitiveness in international markets. For example, European countries' initiatives in export promotions are expected to increase in the next few years, especially in Asia and Latin America. They are actively working on developing closer trade relations with Latin American countries. With exports becoming increasingly important to the US economy, and export sales rising at three times the rate of domestic sales (Trostle, 1997), the US will be expected to increase its initiatives in Asia and Latin America as well. It is positioning itself to have better than most-favoured-nation status in these regions through such initiatives as APEC and the FTAA. This implies that we should expect an aggressive focus on export initiatives by US agri-food industries and their government in enhancing their competitiveness in the international marketplace in response to European and other initiatives (FAS, 1998).

In addition to the expenditures on export subsidies and export promotion initiatives, some governments are also increasing their expenditures on export credits and export credit guarantees. The OECD notes the need to bring agricultural export credits into the same disciplines as the Export Credit Arrangement (OE CD, 1998). Ag-Report.com, an Australian Internet site dedicated to watching and analyzing US agri-food policies and their impacts on Australia's agri-food, reports that in the first month of 1998, the US had US$162 million of agricultural export credits into the South Korean market *alone*, with the meat industry being the largest user (US$20 million), followed by exports of corn, cotton and soybeans. This is more than Canada's total expenditure on export subsidies and export promotions in the twelve months of 1997!

Other approaches involve the development of joint ventures between the exporting country and the importer, which increases the difficulty of identifying and tracking such subsidies. For example, the Australian Wheat Board invested in a flour mill in Shenzhen, China and contributed to building a flour mill financed by the government of Vietnam. The effect of such ventures on the Canadian wheat

[15] Dairy is under a special program, Dairy Export Incentive Program.

industry, for example, is not difficult to imagine, when it comes to potential purchases of wheat for the venture capital flour mills.

FAS news releases indicate that the targeted countries for EEP and the Dairy Export Incentive Program are important markets for Canadian industries. For example, half of the US$27.5 million in US government funding enjoyed by the Foreign Market Development Cooperator, a program that was started in the 1950s, was spent on wheat, feedgrains and soybeans (FAS, 1998). Similarly, Europe's initiatives are in Asia and Latin America, the very markets that Canadian industries are focussing on in a new trade environment.

What, then, could the impact of these international export promotion subsidies be on the estimated net benefits? We simulate the potential impact of these foreign government initiatives on Canada's agri-food industries on the basis of the industries that are most targeted.

Recognizing the impact of these export initiatives on prices influence the results presented in the previous section of this report. Given the assumptions we presented at the beginning of this section, the principal effect of these subsidies is that the full benefits of tariff reduction on world prices are not realized. The wedge between the price in the absence of such export enhancement initiatives and the true liberalized trade prices results from the subsidizing effect of such initiatives. Taxpayers in the countries undertaking these initiatives are those who suffer, along with exporters from competing countries, and the winners are the exporters whose exports are facilitated by the programs.

7.3 Domestic Subsidies

As indicated earlier (Section 4), measuring domestic subsidies is more difficult, primarily because of the variety of programs that may qualify as such subsidies or be camouflaged from being counted as domestic subsidies. The policy direction in most OECD countries over the past decade is the continued reduction in support programs and the emphasis on helping the agricultural sector earn its worth from the market instead of the treasury. The Uruguay Round's agreement to reduce such subsidies in volume and value by 21% and 36% of the base level subsidies has contributed to the disciplines already being applied to domestic subsidies.

Domestic price support programs are effective if they are accompanied by supply management, which automatically requires some form of border protection to be effective. The effects of such programs are not as straight forward as those of export subsidies because they can be positive or negative even for the industries benefiting from the policy. For example, they may limit producers' ability to respond to both domestic and international opportunities. They also muddy price signals, making it difficult for producers to respond to market opportunities or threats. Moreover, such programs often are a disincentive for facilitating the necessary adjustments when significant change is occurring in the marketplace or along the supply chain. Both the US and the EU are slowly moving away from such programs. For example, the US abandoned its acreage set aside program with its deficiency payment payments in 1996 while the EU has reduced its set aside rates. However, support prices and other direct

payments remain in place and continue to influence producers and affect market conditions.

Although many developed countries have reduced substantially or eliminated input subsidies, and others have even introduced levies on certain chemical inputs for environmental protection reasons, the use of direct payments is on the rise in domestic policy environments.[16] These direct payments are seen as having fewer market distorting effects than support programs and allow the achievement of other policy objectives such as rural development and structural adjustments in the sector (OECD, 1998). It is also argued that such direct payments are more transparent than market price support programs. Regardless of the economic rationale attributed to direct payments, they remain powerful tools that can alter the competitiveness of certain industries as we move into a more liberalized trade environment.

The OECD estimates that the US Production Flexibility Contract and Mexico's PROCAMPO payments are the most decoupled programs aimed at compensating farmers for reductions in other support programs. Canada's compensation program for eliminating the Western Grain Transportation Subsidy was decoupled, temporary and phased-out in 1997. Contrarily, the EU's area payments are linked directly to the production of qualifying crops. Furthermore, they are not fixed for any period of time. This makes the EU's reforms to domestic subsidies a little disconcerting within the general scheme of decoupled and falling domestic subsidies.

Table 7.2 presents the total producer subsidy equivalent measures for selected countries as estimated by the OECD (1998). The producer subsidy equivalent (PSE) indicator developed by the OECD measures the value of the monetary transfers to agriculture from agricultural policies in a given year. It includes market price support (regulatory), direct payments (direct) and general services (indirect) (OECD, 1998). As a proportion of total value of production, Canada's PSE decreased from 42% in the 1986-88 period to about 20% in 1997. Similarly, PSE in the US declined from 30% to 16%. Contrarily, the EU's PSE as a proportion of total value of production decreased from 48% to 42% over the same period. Thus, the EU's rate of reduction is much slower than most other OECD countries.

Looking at these PSEs from the perspective of number of full time farmers sheds some interesting light on the relative degree of domestic subsidies accruing to producers in Canada and competing countries. Table 7.2 shows that PSE per full time farmer equivalent (FTFE) in Canada decreased from US$15,000 to US$8,000 between 1986-88 and 1997. This compares with the US PSE per FTFE of US$20,000 in 1986-88 and decreasing to $13,000 in 1997. The EU's PSE per FTFE actually increased between 1986-88 and 1997 from US$12,000 to US$18,000. Also, the EU's PSE per hectare of agricultural land was US$526 per hectare in 1997, about 8½ times US and Canada's PSEs per hectare of about US$60.

As with export subsidies, these high domestic supports in the EU will have to decrease as we move into a more liberalized trade environment otherwise we will see similar results as were observed by Schmitz et al. for US barley EEP bonuses and Canadian barley exports to the US. To this end, we simulate the effect of both export and domestic programs on the basis of their effects on domestic and world market prices. We turn our attention to this in the next subsection.

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[16] The Scandinavian countries have taxed pesticide use for a number of years.

Table 7.2: Total Producer Subsidy Equivalent and Producer Subsidy Equivalent Per Full Time Farmer Equivalent for Selected Countries

Country		1986-1988	1992-1994	1995	1996p	1997e
Australia	US$ mil.	1033	1110	1281	1145	1075
	US$'000	3	4	5	4	4
Canada	US$ mil.	5839	4814	3934	3797	3135
	US$'000	15	12	11	10	8
EU	US$ mil.	67822	79851	91742	82181	72682
	US$'000	12	19	22	21	18
Japan	US$ mil.	34341	39559	48597	39761	33184
	US$'000	16	28	34	29	24
Mexico	US$ mil.	2985	5233	-11	1227	2431
	US$'000	n.a.	n.a.	n.a.	n.a.	n.a.
New Zealand	US$ mil.	525	102	146	140	143
	US$'000	5	1	1	1	1
US	US$ mil.	32532	26348	17344	22614	22791
	US$'000	20	15	10	13	13

Source: OECD Secretariat, 1998.
P: provisional; e: estimate; EU-12 (1986-1994), EU-15 from 1995.

7.4 Simulation of Effects of Subsidies on Net Benefits from Trade Liberalization

In the absence of credible and extensive data on the effect export enhancement and domestic support programs have on free trade prices, we use the case of barley trade between Canada and the US barley EEP during the period of dual marketing in 1993 (Schmitz et al., 1998) to illustrate the potential impact of such support programs on the estimated net benefits presented above. Schmitz et al. estimated equilibrium prices for barley price in the EEP and non-EEP markets and found that the former was 26% lower. We used this estimate to determine the potential effect of such policies on Canada's agri-food system. This illustrates, in a very select way, how government support programs, be they in the domestic market or in the export market, are going to influence potential net benefit outcomes from trade liberalization.

We assumed the effect of the policy on both domestic and world market prices to be the same, in essence assuming complete price transmission. We also modelled a decline in the policy as tariffs declined since such policies provide no effective benefits in the absence of some border protection. Hence, the wedge between the with-policy and without-policy prices decreases, and eventually vanishes, as tariffs approached zero.

Table 7.3 shows the summary of the estimated average annual net benefits for the selected industries with an export/domestic support program in place for barley (alone) in markets that are big enough to influence world market prices, and hence domestic Canadian prices. The results show that the average annual net benefit for barley is zero under the 20-year sunset scenario compared to about $126 million under the 10-year scenario. In other words, under an environment where tariffs are declining to zero over twenty years, the barley industry does not gain anything vis-a-vis tariffs declining at the Uruguay Round rates if there are domestic/export support programs in place that cause barley prices to decline up to a maximum of 26%. The total average annual net benefit under this policy scenario is $1.02 billion under the 20-year scenario and $2.5 billion under the 10-year scenario.

Table 7.3: Average Annual Net Benefits by Industry with Export/Domestic Policy In Effect

Industry	20-YEAR	10-YEAR
Barley	0.00	125.92
Beef	338	1,120
Canola	206.85	624.29
Chicken	(112.65)	(288.99)
Corn	26.70	79.74
Dairy	(78.83)	(308.87)
Eggs	(58.13)	(149.95)
Pork	556.43	811.49
Soybean	31.98	75.49
Wheat	107.90	406.38
Total Net Benefit	**1,017.76**	**2,495.94**

Table 7.4 shows the effect of the barley export/domestic program on the "free trade" net benefits presented in Table 6.7 above. It shows the difference between average annual net benefits without domestic/export programs and with such programs in place. It is interesting to note the system effect of a single policy target (barley) and its influence throughout the agri-food industries. Thus, with the exception of corn and soybeans, both Eastern crops, all the industries included in the agri-food system used in this research were affected by a barley support program that was large enough to influence barley prices.

Table 7.4: Effect of Domestic/Export Support Policy on Average Annual Net Benefits

Industry	20-Year	10-Year
Barley	76.87	110.25
Beef	3.28	5.91
Canola	(46.15)	(138.65)
Chicken	0.05	(0.82)
Corn	0.00	0.00
Dairy	0.03	(0.48)
Eggs	(0.09)	(0.23)
Pork	22.44	22.28
Soybean	0.00	0.00
Wheat	7.95	16.31
Total Net Benefit	**64.39**	**14.56**

The direct effect of the policy on barley was the highest in comparison to the indirect effect of the policy on other industries. The average annual net benefit for barley under the without-policy environment was 100% higher for the 20-year scenario and 47% higher for the 10-year scenario. Contrarily, the average annual net benefit for canola under the without-policy environment was lower by 29% for both sunset scenarios. Wheat experienced a 7% and 4% higher average annual net benefit

under the without-policy environment vis-a-vis the with-policy environment. In total, the without-policy environment yielded a 6% and 1% higher average net benefit under the 20-year and 10-year scenarios respectively. That the 10-year scenario yielded a lower effect may be attributed to the fact that the policies engendering the price wedge are eliminated by 2014, allowing the industries to operate without any policy intervention for the remainder of the simulation period.

7.5 Effect of Technical Barriers to Trade and Sanitary and Phytosanitary Measure

We have thus far evaluated the potential effects of tariff reductions and government domestic and/or export support programs on the selected Canadian agri-food industries. There is a realization among industry leaders and international trade watchers that technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures will increasingly become problematic in international trade if rules guiding their use are not clarified, tightened and enforced. Often, governments use these instruments to address human, animal or plant life and safety concerns. They become necessary because there is a perception that the market is incapable of transmitting the appropriate information to allow consumers and other players in the supply chain to evaluate the true quality and other characteristics of a product and react accordingly. This failure on the market's part may be a result of information asymmetry or transaction costs.

However, in the past few years, there have been instances where the perception is that TBT and SPS instruments have been used more to restrict trade than for their legitimate health and life protection. For example, the EU beef hormone ban and the Chinese tobacco blue mould ban have been estimated to have significant impact on the respective Canadian industries (CAHI, 1998; Amanor-Boadu et al., 1999). The Ontario flue-cured tobacco industry, for example, is estimated to lose about 4,500 tonnes of tobacco leaf exports into China because of its blue mould ban (Amanor-Boadu et al., 1999). Furthermore, the EU's position on genetically modified organisms (GMOs) in the past few years is well documented. So far, both the Canadian soybean and canola industries indicate the effect of the EU has been minimal because of strong market conditions.

Unlike other policies such as export/domestic support, TBTs and SPS measures are discontinuous in nature – they are introduced at some point and when the triggering conditions change, they are removed. We create a hypothetical, but plausible scenario where major world market players for canola decide to ban all genetically-modified canola from their countries. What would the impact be on the estimated net benefit of the Canadian agri-food system? To simulate this scenario, we assume that the ban is implemented in a particular year and removed two or three years later. We also assume that it affects the domestic and international prices of canola and canola products. This effect is assumed to be a 20% drop in canola prices in the year of the ban (since it was not foreseen) and a gradual rise to the pre-ban price levels after the ban is lifted. The ban is assumed to be implemented in 2006 and removed in 2008.

Table 7.5 shows the results of the net effect of a GMO ban directed at canola on the net benefits of the selected agri-food industries. The net effect is the difference between the average annual net benefits without the non-tariff barrier and with it. As expected, the ban had a significant impact on the canola

industry, with an average annual net benefit of $127 million and $407 million for the 20-year and 10-year scenarios. These were respectively 22% and 16% less than were obtained under the no-ban situation. The ban had a marginal impact on the relative net benefits for barley and wheat, crops that are in direct competition for land with canola, and had no effect on the rest of the industries. Thus, unlike the domestic/export support program for barley that created significant effect through the industry, Table 7.5 indicates that the effect of a two-year ban on Canada's canola exports will be principally contained within the canola industry. Despite this marginal impact, the net benefits for barley increased with the ban while that for wheat decreased. The foregoing show a strong substitution effect between canola and barley as far as their average net benefits go. For when barley net benefit decreased as a result of foreign government domestic/export support programs, the average annual net benefit for canola increased and a ban on canola exports led to an increase in barley's average annual net benefits. The total effect of the ban is to reduce total average annual net benefits by 3.4% under both sunset scenarios.

Table 7.5: Average Annual Net Effect of a GMO Canola Ban

Industry	20-Year	10-Year
Barley	(0.38)	(1.00)
Beef	0.00	0.00
Canola	36.08	78.28
Chicken	0.00	0.00
Corn	0.00	0.00
Dairy	0.00	0.00
Eggs	0.00	0.00
Pork	0.00	0.00
Soybean	0.00	0.00
Wheat	0.85	7.01
Total Net Benefit	**36.55**	**84.29**

7.6 Food Safety, Quality and Biotechnology

It used to be that trade negotiations were conducted solely by government trade officials and the results transformed into policy with little or no public input. The preponderance of bilateral and multilateral trade agreements over the past decade has increased the activeness of civil society in the trade negotiation process. This has resulted from an increase and an improvement in the information transmission channels available to society. Also, there has evolved an increased awareness of the relationships between trade and social and economic development among many citizens. Therefore, the agenda of trade negotiations has been expanding to address the emerging issues involved with the concerns of society as a whole. The emerging issues at the Next Round of WTO that could influence the estimated net benefits from trade presented in the this report include, but are not limited to food safety, biotechnology, environmental protection and sustainable development. We present a review of these issues within the context of their potential influence on the net benefits of liberalized trade to Canada's agri-food industries.

7.6.1 Food Safety and Quality

Trade is perceived by some interest groups in some developed countries, particularly Europe, Canada and the US, as having the potential to reduce food safety standards. This emanates from the perception

that definition of technical barriers to trade and sanitary and phytosanitary measures are going to harmonize safety standards downwards (Silvergrade and Farzan, 1997). The Centre for Science in the Public Interest, a US-based consumer organization, for example, indicates that since the Sanitary and Phytosanitary measures agreement designated Codex Alimentarius as one of the sources of recognized international standards for resolving trade disputes, "other countries may challenge any US regulatory standard as a trade barrier if the standard exceeds those set by Codex" (Silvergrade and Falzan, 1997). Their conclusion is that US participation in the Uruguay Round Agreement has provided Codex with "unprecedented influence over US food safety and quality standards," forcing the US to lower its food safety standards.

Whether the activities of these public and consumer interest groups are responsible or consumers are generally just becoming increasingly active with respect to demanding safe food products remain to be confirmed. However, government is responding to food safety concerns by instituting mandatory food safety and sanitation practices. The US government, for example, introduced its pathogen reduction and HACCP regulation in meat processing plants in January 1996, and all meat processing facilities are expected to be HACCP-approved by January 2000.[17] As of January 1998, about 75% of all raw meat and poultry processed in the US were under HACCP. In addition, all federal processing plants, regardless of size, were required under the HACCP law to have standard sanitation operating procedures (SSOPs) in place in 1997. The focus of the SSOPs was on E. Coli and Salmonella.[18]

The EU hygiene legislation of 1993 called for the adoption of risk management tools like HACCP by all food businesses. However, EU members have adopted the legislation to different degrees because food safety differs from country to country (Bredahl and Holleran,1997). The difference in food safety standards may be attributed to such national differences as taste, income distribution and wealth (Orden et al., 1996). Canada is moving in the HACCP direction but unlike the US, on a voluntary basis. However, industry watchers point to the fact that HACCP and other documented food safety and quality processes will increasingly become differentiating points even if they are not used as technical barriers to trade. The existence of these procedures, however, does not imply trade disputes resulting from the application of technical barriers to trade or SPS measures will become history. It only means that disputants will have a better frame of reference to address their concerns (Hooker and Caswell, 1996).

The foregoing analysis took for granted the safety of Canada's agri-food products, assuming off the quality, nutrition, safety and other characteristics that influence consumption (Bredahl and Holleran, 1997). Once we move from that homogeneity assumption and recognize that consumers demand products, including food, on the basis of their characteristics as well as price, then the question of food safety and quality become important in influencing the outcome of trade liberalization. The price projects used in the simulations were determined for *commodity* products. This implies that introducing

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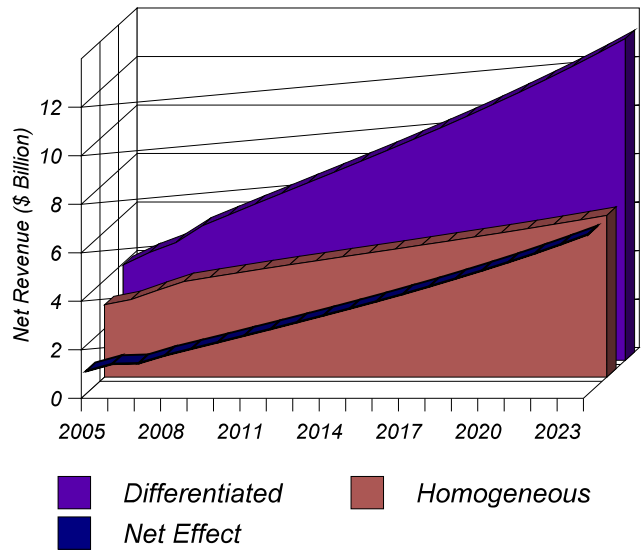
[17] The Food Safety and Inspection Service graduated the mandatory HACCP approval process, with the deadline for large firms (500 plus employees) being January 1998, small firms (10 to 50 employees) in January 1999 and very small firms (less than 10 employees) in January 2000.

[18] Between January 1997 and January 1998, the FSIS had witheld the mark of inspection from twenty plants for violating SSOPs.

food safety and quality into the equation will increase the realized prices. The question that emerges is what proportion of Canada's agri-food products will be differentiated and marketed in the high quality and high food safety segment of the marketplace? Suppose that 20% of total pork produced over the simulation period is "high quality," and this commands a 15% premium in the market and 7% premium at the farm (cost remaining unchanged), we can estimate the effect of segmenting on the basis of quality and food safety on the net benefits from trade liberalization.

Figure 7.1 illustrates the net revenues emanating from conducting the differentiation experiment presented above. It shows that over the simulation period (2005 to 2025), with only 20% of Canada's hog and pork production designated as "high quality" and thus attracting the specified premiums, net revenues for the hog/pork industry under the 10-year sunset scenario increases by 33% of net revenue for the homogenous situation in 2005. This rises steadily to 99% by 2024, giving a net revenue in that year of $13.3 billion for the industry. The average annual net revenue to the hog/pork industry for successfully differentiating 20% of its total production (hogs and pork) as high quality and extracting 15% premium in the market and 7% premium at the farm is $8.5 billion compared to $4.9 billion for the undifferentiated situation, an average increase in net revenues of about 70%. The implication of this is that the homogeneity assumption critically underestimates the potential net benefits from trade liberalization.

Figure 7.1: Net Revenues for Differentiated and Homogeneous Pork Under the 10-Year Sunset Scenario



A similar result will be expected for all differentiation of products on the basis of quality or value-adding. For example, differentiating the homogeneous cheese products used in the analysis into different value categories and including other products such as high value ice-cream and yoghurt will influence the dairy industry net benefits, particularly at the processing level (Meilke et al., 1998). The extent of the influence depends on the proportion of these high value products in the total mix of the industry's products and the price differential they command.

7.6.2 Biotechnology

Biotechnology is increasingly becoming a contentious issue in trade, especially between North America and Europe. The problem's origin is the extent of variability applied to risk assessment by the various signatories to the Uruguay Round Agreement on Sanitary and Phytosanitary (SPS) Measures, which

is the principal agreement covering the questions of biotechnology and associated risks/safety. Some of the variability is due to non-scientific concerns, such as ethical and social concerns. Others emanate from lack of understanding and consensus on the diverse issues related to genetically modified organisms as well as genuine incomplete knowledge about the stability and implications of transgenes in the native plants and animals. As a result of this incomplete knowledge and the questions current data on risks raise in the scientific communities, civil society and policy makers are left with very diverse policies across countries. For example, in an appraisal of the working of the EU's Directive on the deliberate release of GMOs, von Schomberg (1998) notes that regulators could not agree on the important factors that might be considered in a risk assessment and what potential effects might be used as grounds for refusing to approve the release of a GMO. As a result of this lack of a consensus or standards, regulators have been forced to erect their own normative standards and are, in effect, making value judgements in formulating decisions on GMOs.

The extent of the difference in perceptions about GMOs across countries may be illustrated by Novartis' applications for its Bt corn in various countries. In the US, for example, various genetically modified crops have been registered and released for use by the USDA. In contrast, Novartis was refused approval in Italy, Austria and Luxembourg on the basis of the potential for gene flow conferring weediness to wild relatives. The UK, on the other hand, argued that weediness associated with herbicide-tolerant canola was not a risk if there was technology to control the weeds (Levidow et al., 1996).[19]

Until scientific standards and protocols as well as interpretations of data are accepted by the scientific community on whom policy makers depend to develop approval conditions, the issue about SPS and biotechnology will remain a contentious trade issue, especially between the EU and North America. The problem is exacerbated when basic information on ecologically unique environments is unavailable or insufficient, leaving room for value judgements that may or may not have trade restraining outcomes.

Given the adoption rates of biotechnology and GMOs in Canada's agri-food industries, the longer it takes for these standards and protocols to be established, the greater the potential for the estimated net benefits from trade liberalization to be lower than what are realized. While socioeconomic considerations contained in national biosafety legislation will unlikely be acceptable by any WTO Dispute Settlement Body, the absence of these standards and protocols will allow countries who want to use these arguments to control trade to *hide behind* such seemingly legitimate arguments of human, plant and animal health as well as environmental protection (Wyndham and Evans, 1998).

[19] The EU is addressing its disagreements about such issues by majority rule.

8.1 Summary and Conclusions

This section is divided into two subsections, the summary and the conclusions. In the summary subsection, we identify the threads linking the preceding sections together into a coherent story. We also discuss the potential limitations of the net benefits calculated given the data, modelling and other idiosyncrasies of the research methodology. The conclusion subsection provides the salient learning emanating from the study. It also presents some recommendations for Canada's agri-food stakeholders to consider as they move into the Next Round of negotiations under the WTO.

8.2 Summary

8.2.1 Problem, Objectives and Modelling Assumptions

The completion of the Uruguay Round of GATT was the first time agriculture was brought completely under standard global trade rules other industries had been dealing with for almost forty-five years. While each segment of the Agreement on Agriculture was important to Canada's agri-food industries, it was market access that received most attention. This was because it was perceived on the one hand as a threat to the protection Canada's supply managed industries had enjoyed under Article XI (ii)c, and on the other as a great opportunity to increase exports by the non-supply managed industries. For the latter group, they were more concerned about the threat posed by export and domestic subsidies, especially those by the US and EU.

With the Next Round of the WTO about to start, the Canadian agri-food sector has been preparing itself to develop a negotiation position that is based on a better understanding of the potential benefits for the whole sector instead of its parts. Herein lies the study's problem: What are the net benefits accruing to the various industries under a liberalized trade policy environment?

The overall objective of the research was to provide quantitative estimates of the net benefits to the Canadian economy from increased agricultural trade liberalization that could occur in the Next Round of WTO Negotiations. The specific objectives encompassed examining the potential for exporting consumer-ready products for Canada's agri-food industries, the distribution of government transfers to agriculture by provinces and the effect of export and domestic subsidies provided by foreign governments on Canada's agri-food industries net benefits from trade liberalization.

We used a number of approaches to address the various objectives of the study: Literature reviews, conversations with industry stakeholders, data review and analysis, and a system dynamic modelling approach. The boundaries of the system dynamic model were defined by ten principal agri-food industries – beef, pork, dairy, chicken, eggs, barley, wheat, corn, soybeans and canola. The selection was based on farm cash receipts, policy influence and trade exposure. Thus, we determined what proportion of total farm cash receipts was accounted for by each industry, how much were they influenced by agricultural trade and other policies and how much exposure did they have to international trade policy changes. The crop industries in the model together accounted for 62% of total

crop farm cash receipts while the livestock industries accounted for 93% of total livestock farm cash receipts in 1997.

The model assumptions were divided into three broad groups:

1. Broad assumptions – covering the model content and structure. They included such assumptions as the model boundary (i.e., industries included in the model), homogeneity, and relationship among industries.
2. Price assumptions – covering price projections and price relationships. Theoretically, prices increase in net exporting countries and decrease in net importing countries when tariffs are removed.
3. Policy and other parameter assumptions – covering such items as tariffs and tariff rate reductions, yield, productivity, and elasticities.

8.2.2 Background and Sector Environment

There are three components to the background and sector environment analysis that was conducted for this research: (1) Industry trade performance, (2) Market orientation in Canada's agri-food sector, and (3) Government transfers to agriculture.

Agri-food sector's trade performance: Total agri-food exports have been increasing steadily over the past decade. However, exports to the US have been increasing at a faster rate since the Canada-US Free Trade Agreement came into effect in 1989. Total agri-food exports exceeded $20 billion in 1997, with the US accounting for almost 60% of this. Net exports to the US reached $2.4 billion by 1997 from a negative $800 million in 1988. The effect of the Canada-US FTA was a significant contributor to these results. Not only have net exports been increasing, but the composition of Canada's exports to the US has been transformed – a larger proportion of export revenue is being derived from consumer-ready products. For example, by 1997, consumer-ready products accounted for 54% of the total value of exports to the US compared to 51% in 1994. This contrasts with the proportion of total exports to the rest of the world accounted for by consumer-ready products – 18.5% in 1997 compared to 14% in 1994. This illustrates the extent of how elimination of tariffs benefits high value-added products due to tariff escalation policies. It indicates what the outcome of trade liberalization could be as successful for Canada's agri-food global trade as it has been for its US trade.

Although its total exports are increasing, the global agri-food market size is increasing at a faster rate than Canada's agri-food exports. As a result, Canada's share of the global agri-food market has been declining. The Canadian Agri-Food Marketing Council has identified that to change this trend of declining market share, Canada would have to increase its exports of value-added products. The possibility of doing this, we have shown, lies in obtaining increasing market access to markets that have been *closed* to Canada through tariffs or non-tariff barriers to trade. Given the growth rates observed in recent years, we estimate that total exports of consumer-ready products could increase to about $34 billion by 2008 under prevailing policies.

Market orientation in Canada's agri-food sector: One way of looking at Canada's agri-food industries is by their orientation to market forces. The supply managed industries have relatively high tariffs protecting them from international competition while traditionally managing production and price through orderly marketing. The non-supply-managed industries, on the other hand, do not have such border protection measures, at least not to the same extent as for the supply-managed industries, and have no control over their supply as an industry. Therefore, they compete with each other within the industry, experiencing significant volatility in their prices and/or incomes.

The analysis of market orientation indicated that the supply-managed industries accounted for about 26% of total net farm cash receipts and 18% of total value added at the processing level. Thus, the non-supply managed industries accounted for the largest proportion of agri-food sector net revenues or value added. From that perspective, they should not be overlooked in any negotiation since a large segment of the whole agri-food sector depends on them. This is especially true when it is recognized that the non-supply-managed industries are confronted by significant trade barriers – tariffs, tariff rate quotas, technical barriers to trade, etc. – in the international marketplace. This means seeking through the negotiations to gain an improved market access for these industries should be on top of negotiators agenda. Since it is impossible to gain access without giving access, policy makers and industry stakeholders for the supply-managed industries should work on developing programs that facilitate the transition from protection to global competition.

Government transfers to agriculture: Government transfers to agriculture may be divided into three principal types: (1) Direct transfers; (2) Indirect transfers, and (3) Regulatory transfers. Direct transfers include direct non-regulatory payments or foregone revenues provided directly to producers. Indirect transfers, on the other hand, include non-regulatory programs in which government transfers are provided to agriculture as a whole but not directly to producers. Regulatory transfers are revenues received by producers as a result of regulations that influence prices in the marketplace.

Government transfers to agriculture data shows a significant shift from an upward trend in the pre-1990 era to a downward trend in the post-1990 era. Total government transfer to agriculture decreased by almost 50% from $8.1 billion in 1990 to $4 billion in 1996. It decreased in all provinces and as well as by the types. The western provinces accounted for about 55% of total government transfers between 1990 and 1996. Alberta's share of the western provinces' total transfer averaged about 33% between 1990 and 1996.

Regulatory transfers have also been decreasing between 1990 and 1996, from about $2 billion in 1991 to $1.3 billion. The western provinces' share of total regulatory transfers decreased from 25% to 22% between 1990 and 1996. Alberta's share of the total regulatory transfers in the western provinces averaged about 30.5% over the same period. The largest share of regulatory transfers was accounted for by Ontario and Quebec. This may be due to the relatively large proportion of their supply managed industries.

Total indirect transfers to agriculture in Canada decreased from $1.6 billion to $837 million between 1990 and 1996, an average annual rate of decline of 6.2%. The western provinces accounted for an

average of 74% of total indirect transfers between 1990 and 1996. Alberta's share of the western provinces' total indirect transfers averaged 32.6% over the period.

Total direct transfers to agriculture decreased from $2.9 billion to $1.85 billion, at an average annual rate of about -4.9% between 1990 and 1996. The total share of the western provinces increased from 58% in 1994 to 70% in 1996. The termination of the WGTA and the associated direct payment to prairie producers may be the reason for this significant increase in the Western region's share of total direct transfers.

It is important to note that government transfers in Canada are also decreasing in relation to transfers in other major agri-food trading nations. For example, the producer subsidy equivalent per full time farmer equivalent (FTFE) in Canada decreased by 47% from US$15,000 to US$8,000 between 1986-88 and 1997, compared to a 35% decrease in the US, from US$20,000 in 1986-88 and decreasing to $13,000. The EU, on the other hand, increased its PSE per FTFE by 30% in the same period, from US$12,000 to US$18,000. This means EU farmers' support in 1997 was about 125% higher than that in Canada. Also, the EU's PSE per hectare of agricultural land was US$526 per hectare in 1997, about 8½ times US and Canada's PSEs per hectare of about US$60.

8.2.3 Net Benefit from Trade Liberalization

We defined trade liberalization as the complete elimination of all tariffs and other border constraints on agri-food products. Completely eliminating tariffs and other border constraints reduces the economic usefulness of such policies as export and domestic subsidies. Therefore, in the liberalized trade environment modelled in this study, we assumed that quotas, tariff rate quotas, technical barriers to trade, and all other trade distorting policies were absent.

We defined three principal scenarios:

1. Base scenario under which tariffs under the next Round were assumed to decline at the same rates as the Uruguay Round
2. Twenty-year sunset under which tariffs were assumed to be completely eliminated within 20 years from the beginning of the next Round. This implied higher rates of reduction than the Uruguay Round.
3. Ten-year sunset under which tariffs were assumed to be completely eliminated within ten years from the beginning of the next Round.

We defined net benefit from trade liberalization as the difference between the net revenues under a sunset scenario and base scenario. We presented the results of the full liberalization, and then introduced some shocks to the model to determine "what if" outcomes: What if export and domestic support are not fully eliminated? What if products are not homogeneous? What if certain "legitimate"non-tariff barriers are imposed on Canada' agri-food industries? We conducted the simulation over twenty years, from 2005 to 2024, for each of the defined scenarios.

Full Liberalization: The simulation results indicated that the total average annual net benefit for the selected industries under the 20-year sunset scenario was about $1.1 billion compared to $2.51 billion for the 10-year sunset scenario. This means that if the Next Round of the WTO came out with a ten-year sunset on all tariffs, and all members were fully compliant, the selected agri-food industries in the model will together increase their average net revenues by $2.51 billion per year compared to what their average annual net revenues will be with the Uruguay Round tariff reduction rates. Over the 20 years' simulation period, the cumulative net benefit under a 10-year sunset on all agri-food tariffs is $50.2 billion.

Not all industries posted positive net benefits. The supply-managed industries of chicken, dairy and eggs all posted negative net benefits under both sunset scenarios. This implies that these industries are better off with a Round that came out looking much like the Uruguay Round with respect to tariff reduction rates. For example, the dairy industry's average annual net benefit was -$309 million while eggs and chicken had -$150 million and -$290 million respectively. This means that over a 20-year period, the cumulative net benefit to the dairy, chicken and eggs industries will be -$14.9 billion under a 10-year sunset for all tariffs.

Since these net benefits are actually the incremental net revenues emanating from the trade policy change, we may want to assess how they compare with the average annual net benefits in the base scenario. This provides an indication of the extent of adjustment required in the various industries, especially those that experience negative net benefit.

Table 8.1 presents the trade liberalization effect (TLE) for the two sunset scenarios. The TLE is the ratio of the average annual net benefits under the sunset scenario to the average annual industry net revenue in the base scenario for the selected industries. It indicates the percentage change in net revenues resulting from the trade liberalization policy. It is observed that the egg industry experiences the largest loss of net revenue under both the 10-and 20-year sunset scenarios – -33% and -11% respectively. This means the net revenues under the 10-year sunset scenarios is only 67% of its base scenario net revenue. Chicken and dairy, on the other hand, had TLEs of -5% and -4% respectively. Beef and canola experienced highest TLEs of 23% and 15% respectively.

Although prevailing mental model in most of Canada's agri-food circles is that high tariffs are required to protect the farm segment of the supply-managed industries from competitors, our results showed that the farm levels of these industries, with the exception of eggs, all posted positive net benefits. For example, the average annual net benefit for dairy producers under the 20-year scenario was $154 million compared to $6.4 million for the 10-year scenario. Thus, the negative net benefits for the dairy and chicken industries emanated from the processing level. Conversations with industry watchers indicated that this was no surprise at all. They pointed to the strong price competitiveness of Canada's supply-managed industries at the farm level compared to that of the processing level. However, it is important to note that only primary processing was evaluated in the study, limiting the total net benefits accruing at the processing level.

"What if" analysis: The influence of foreign government domestic/export support for their industries

on Canada's agri-food industries was investigated using barley export support as an example. The experiment determined the potential wedge between prices in the markets benefiting from the support and those that are not. The results showed two major outcomes: (1) the Canadian barley industry loses as a result of the support, and (2) export or domestic support for one commodity in one industry may be felt outside that industry, exhibiting counteracting or reinforcing effects in these industries. In the barley support experiment, we found that the Canadian barley industry lost all the benefits it could gain under the 20-year scenario with an export support program that led to a 20% price reduction in the first year of the program. Under the 10-year scenario, the barley industry lost about $110 million per annum as a result of the export support program. On the other hand, the canola industry gained $139 million on average per year. Hence the gain for canola as a result of the barley export program more than compensates the loss in the barley industry but not enough to compensate the remainder of the losses through the system. On the whole, the policy shock yielded a negative effect on the Canadian agri-food sector, decreasing total net benefits by $15 million under the 10-year and $64 million under the 20-year scenario.

The other "what if"experiment was differentiation (perceived food quality characteristics), bearing in mind that we had assumed homogeneity of products in the model. We defined a situation where 20% of all pork produced could be differentiated as having some special characteristics that the market was prepared to pay a 15% premium at the processing level and a 7% premium at the farm level. The results provided a strong support for Canadian agri-food industries to seek approaches to differentiating their products in an increasingly liberalized global market. The average net revenue for the hog/pork industry under the 10-year sunset scenario was $8.5 billion for the pork industry with differentiated products compared to $4.98 billion for the pork industry with homogenous products.

The foregoing experiment on differentiation may be applied to further processing and higher value-adding initiatives that may be envisaged for the various industries. Thus, while baked goods was not modelled in this study, industry watchers point to their opportunity slate in a more liberalized trade environment. Incorporating them, and identifying their specific characteristics that cause price differentiation could result in significant increases in total net revenues directly for those industries but indirectly for supply industries such as packaging, transportation, and other industries that facilitate the value-adding process.

The effect of such technical barriers to trade on the importation of products deemed unacceptable for whatever reason can also have significant implications for regions that adopt these technologies. The experiment we conducted for technical barriers to trade was a ban on GMO canola in major markets which has the effect of reducing prices in the first year of the ban by 20%. The results showed that it had a significant impact on the canola industry, a 22% and 16% less average annual net benefits for the 20-year and 10-year scenarios than were obtained under the no-ban situation. Unlike the barley experiment, the system effects of the ban were minimal.

Although the model showed minimal cross-industry effect as a result of this particular ban, it is possible, depending on the target for the ban, to erode all the benefits that may be obtained under trade liberalization. Technical barriers to trade are going to be increasingly popular as tariffs decline. They

will also be used because of their poor transparency due to the paucity of knowledge, data and protocols. However, the prevalence of biotechnology and bioengineered products in the agri-food sector requires all industry stakeholders to develop a single position on this issue.

8.3 Limitations of the Results

Due to the long-term projections involved with the study, we had to make some strong assumptions about prices and price responses to tariff reductions as well as about industry stakeholders' response to tariff reductions. The parameters were obtained from a number of sources. For example, our base scenario supply elasticities were obtained from Roningen and Dixit (1989). We adjusted these elasticities for the sunset scenario with our interpretation of industry stakeholders' expectations of their responses to tariff sunsets. The supply elasticity parameters were all fixed throughout the simulation. Similarly, prices were projected on the basis of industry leaders' expectations, baseline projections by Agriculture and Agri-Food Canada, USDA, FAPRI and OECD as well as our expectation of the effect of rapid tariff reduction policy on future prices.

These and other parameters such as yields and productivity were fundamental drivers of the results. Changing them could have significant impact on the reported results. For example, increasing or decreasing any of the crop's yield or the productivity of any of the animals can have significant effect on the results. Altering prices in a particular year for a particular product could have telling effect through the system, as seen with the GMO ban experiment. As such, we are the first to say that the results presented in this study can be viewed as one of many potential results that could have been obtained with the model due to the endless permutations that can be developed with the parameters. However, we are confident that the *permutation of parameters* we chose provides the most plausible results.

Therefore, it is important to emphasize that the results presented herein are not **forecasts** of the future but **projections** of how trade liberalization would affect Canada's agri-food industries. They should be used as foundations for developing common ground by the various industries in preparing for the Next Round of the WTO.

A principal limitation of the results is that the model does not encompass all the industries that make up the agri-food sector. We selected industries on the basis of their current and historical contribution to total agri-food revenues, their exposure to international trade policies and by the perceived effect of trade policy change on them. Additionally, data limitations constrained the inclusion of certain industries. For example, industries such as turkey, pulses, sugar beet, spices, seed potato, sheep, emus, dehydrated alfalfa and field peas were not included within the boundaries of the "system." Similarly, data limitations on the relationship between wheat and other grain industries and the bakery and confectionery industries prevented us from including these high value-added components of the grain industries. This leads to an underestimation of the net benefits from trade liberalization. On the other hand, the non-inclusion of such industries as turkey, broiler hatching eggs, and the myriad products of dairy (we only considered cheese, because it is the most *traded* of all dairy products) could lead to an

over-estimation of the net benefits. This outcome may be tempered by the absence of high value added dairy products such as specialty cheeses, ice-creams and yoghurt. Also, the fact that we did not include milk components (ingredients) which are becoming increasingly important products in the dairy industry may also counter the over-estimation of net benefits argument.

Another major limitation of the results is the fact that we assumed the industries that are around today will be the same industries around in twenty-five years. We did not make allowance for the emergence of new industries such as agri-food xenotransplantation industry or phytochemical industry that depends on current or new crop industry. Should any of these happen, the benefits from trade liberalization could be greatly affected. They also exacerbate the importance and the urgency for streamlining the rules guiding the sanitary and phytosanitary measures, GMOs and LMOs (living modified organisms).

We have assumed throughout the study that trade liberalization through tariff elimination will occur in the next round of WTO negotiations and the results of the analysis depended almost completely on this assumption. Nobody knows what the outcome of the next round of WTO negotiations will be. However, there is ample evidence that the road towards trade liberalization has been embraced by all players. For example, although the EU's Agenda 2000 is a wide-ranging reform project aimed at agriculture, incorporation of Eastern European countries and other issues within and outside the EU that are considered critical for the long-term success of the Union, some people believe that the it is also aimed at preparing the EU to be successful in the impending round of trade negotiations under the WTO (Tangermann, 1999). For example, in a communique explaining why the EU's Common Agricultural Policy (CAP) must be reformed, it stated:

> The second factor [in addition to Eastern enlargement of the EU] is the international trade negotiations which are in the offing, both the new round of agricultural talks under the WTO and the negotiations of various bilateral trade negotiations. We cannot expect that these negotiations will result in a reversal of the trend towards greater liberalization of trade . . . The Union has to prepare its agriculture sector for these negotiations. This has two vital consequences: First, with this reform the Union has to lay down the agricultural policy that it intends carrying out in the years ahead in a way that satisfies its own interests and takes a realistic view of developments in the international context. This needs to be done before the opening of the WTO negotiations so **that the Union can negotiate on a solid basis**. . . Second, it must be made clear to all that the reform to be adopted will outline the limits of what the Union is able to agree to in the forthcoming international negotiations (European Commission, 1998). (Emphasis ours).In an earlier release, the European Commission (1997) had emphasized that "Cutting border protection, reducing export subsidies and reshaping internal support towards more "decoupled" instruments will **enhance the Union's negotiating stance in the new round**." (Emphasis ours). Thus, it seems the EU is eager to enter the next round of negotiations with its house in order, so to speak. The US is also taking a similar stance, with the reforms to its 1996 Farm Act and other policies. It has also indicated that the next round of agriculture negotiations in the WTO should result in the complete elimination of export subsidies and major reductions in internal supports (ICSTD, 1998). Similarly, the Cairns group (which includes Canada) set out very detailed objectives for agriculture in the next round, seeking deep cuts to all tariffs, elimination and prohibition of export subsidies, reductions in domestic support levels that distorted production and trade.

Although these initiatives from the major agricultural trading nations all point to trade liberalization, the extent of what will prevail is not known, and will not be known until the Next Round of WTO is signed and ratified by member-countries. To this end, the results of this study indicate one of the potential outcomes, albeit the extreme outcome – supported by the US and some Cairns group members. That the policy environment being modelled is uncertain may be seen as a weakness of the study. However, understanding the extreme outcome of trade liberalization offers Canada's agri-food stakeholders insight into how to negotiate a comprehensive agri-food agreement.

8.4 Conclusions

The research sought to quantify the net benefits that could be obtained by the Canadian agri-food sector if international trade was liberalized in the Next Round of the WTO. There is a general perception in many international trade policy arenas that agricultural trade will not be liberalized for a long time. However, there are a number of precedents that suggest otherwise. For example, the Canada-US Free Trade Agreement and NAFTA placed a sunset on all but a few tariffs. Furthermore, the philosophy at the WTO is that tariffs cannot be reversed, i.e., they can only go down, never up.[20] Furthermore, the US and the Cairns group have both indicated that tariffs should be eliminated or substantially reduced. This means that sometime in the future, agricultural trade will be liberalized, which implies that Canada's agri-food industries should prepare themselves for the environment where protective tariffs are no more and access opportunities in both the domestic and international markets become abundant.

This section provides the conclusions to the study by its specific objectives:

1. Canada's non-supply managed agri-food industries accounted for 74% of total net farm income and 82% of total manufacturing value added. Their combined share of total agri-food net revenues (farm and processing) was 79.4%. They also are currently subjected to substantial trade barriers in many international markets. For example, at the time of writing, the US is considering imposing a mandatory country of origin labelling regulation on beef, and the EU had banned growth hormone-treated beef imports from Canada (and the US). Similarly, the EU has trade barriers in place for genetically modified oilseeds. These trade barriers critically alter the competitive position of the affected Canadian industries in the global marketplace.

2. Canada's supply managed industries account for about 21% of total agri-food net revenues (farm and processing). At the farm level, they account for about 27% of total net revenues while their share at the processing level was estimated as 18%. The change in international trade rules under the Uruguay Round allowed Canada and other countries that had quantitative restrictions for certain industries to convert them into tariffs by a process called *tariffication*. As a result, Canada's supply managed industries gained significantly high tariffs that effectively accorded them the same level of protection as the quantitative restrictions had, with the

[20] The only exception to this rule is the implementation of Special Safeguard Provisions under the Agreement on Agriculture of the Uruguay Round of GATT.

exception that the tariffs are bound to decline over time.

3. Since the Canada-US Free Trade Agreement, there has been a change in the composition of Canada's agri-food exports in favour of consumer-ready products. These products are often several times more valuable than commodity or bulk products. In contrast, Canada's shipments to the rest of the world continue to be dominated by bulk commodities. Since tariffs are escalated, eliminating them in a global trade agreement could lead to a similar shift in composition for Canada's global trade. In the absence of any policy change, and based solely on historical performance, we estimated that Canada's consumer-ready product exports could reach $34 billion in 2008, from its current value of about $9 billion. Achieving the elimination of all tariffs, especially those on high value consumer-ready products could increase this estimate significantly.

4. Government transfers to agriculture are declining, and the regional distribution is changing. For example, total agri-food transfers to agriculture decreased by about 50.1% between 1991 and 1996, and the share the western provinces decreased from 60% to 54.5% in the same period. Quebec's share of total government transfers increased by about 14% between 1990 and 1996 compared to decreases of 3% for Alberta and 11% for Saskatchewan. The Canadian public policy on farm support has changed and it is important that we work through the impending trade negotiation to bring those of our trading partners in line. We have indicated how such support programs can adversely affect Canada's agri-food industries.

5. The elimination of all tariffs and non-tariff barriers yielded positive average annual net benefits for the Canadian agri-food sector. The research indicated that total trade liberalization under a ten-year tariff elimination sunset beginning in 2005 will yield a cumulative net benefit of $50.21 billion over twenty years. The cumulative net benefit under the 20-year scenario was $21.64 billion for the industries included in the model. The net benefits are not distributed equally among the sector's industries, though. For example, the cumulative net benefits for wheat and canola over twenty years under the 10-year sunset were respectively $8.45 billion and $9.7 billion. Beef and pork also had large cumulative net benefits under the 10-year sunset scenario: $22.53 billion and $16.67 billion respectively. Together, these two industries accounted for about 78% of the total cumulative net benefits between 2005 and 2024. On the other hand, dairy, chicken and eggs, together accounted for $14.99 billion negative cumulative net benefit over the twenty years.

6. The model we used intrinsically assumed net exports, allow Canada to export only when it has met its domestic needs. The threat of imports affects principally the supply managed sector if they are unable to maintain domestic competitiveness in the face of trade liberalization. Our analyses indicate that the industry is still capable of supplying its domestic needs and export excess supply under liberalized trade conditions even though it suffers in comparison to the non-liberalized trade environment. It is important to note that the farm level of supply managed industries fared much better with trade liberalization than the processing levels. Industry watchers believe that the farm level has adjusted more in recent years than the processing level

has cared to. Undertaking the necessary strategies to enhance the current competitiveness of dairy, chicken and egg processors can lead to a completely different story emerging under a liberalized trade environment.

7. The cost of trade liberalization comes in the form of adjustments that the industry has to make in order to seize its opportunities. We determined that almost all processing facilities will need infusion of expansion capital in order to fully take advantage of the benefits from trade. The cost of these expansions was not estimated but the capacity requirements were. For example, beef processing will need an increase of at least 16.4% of its current slaughter capacity to accommodate the increase in cattle by the end of the 10-year sunset scenario. Chicken, on the other hand, will need to expand processing capacity by 164% by 2024 to take full advantage of the price response to production that is projected to occur in that period. The pork industry will require at least a 10% increase in processing capacity. In addition to these, the producer level will need investments in barns, etc. The industry as a whole will be required to make investments in breeding stock, feed mills, non-meat processing facilities and other support systems that ensure the effectiveness of the supply chains. These are, however, not costs at all, but investments in enhancing competitiveness of Canada's agri-food industries. The sector will not experience the projected benefits if these investments are not made.

8. The negative impacts of trade liberalization include attrition and bankruptcies resulting from some industry stakeholders' inability to compete in a liberalized trade environment. The question that arises is this: If these firms are unable to compete in the face of **fair** international trade, then how have they been surviving? It may seem that they have been riding on the protective policies that provided with them *artificial* competitiveness. That policy creates cost that is borne by somebody – a taxpayer through government transfers, other industry players through price pooling, and/or a consumer through higher prices. Regardless of the source of the support, the whole system suffers from the inefficiencies associated with the policy.

9. It is important to note that we bolded and underlined fair in the preceding paragraph. In the absence of full compliance by some major WTO members, a market failure ensues, leading to significant costs for the countries that play by the rules. Thus far, we know that trade liberalization engenders positive net benefits to the Canadian agri-food industries. Therefore, Canada should support it. But it must work to define the rules that ensure all players abide by the rules so that it can reap the appropriate rewards from increased market access.

10. Using the US EEP program as an illustration of the effect of export/domestic support programs on Canada, we found that if such programs are used in the face of trade liberalization, they reduce the total net benefits accruing to Canada. In the experiment we conducted with barley, the total annual average net effect of an export/domestic support program was a loss of about $64.4 million under the 20-year scenario and a loss of about $15 million under the 10-year scenario.

11. The estimated net benefits from trade liberalization will be translated into investments in the

agri-food industries as well as outside it. For example, not all the extra $250 million in beef farm net revenues obtained under the 20-year scenario go into expanding beef production. It will also go into investing in other industries, increasing employment in the beef industry as well as other industries where such investments go, as well increase consumption. An increase in consumption by beef farmers, for example, in the form of new automobiles, houses or consumer durables all create a significant spillover in the rest of the Canadian (and global) economy. Furthermore, Revenue Canada and provincial treasuries benefit from the estimated increases in the net revenues resulting from trade liberalization. Apart from agri-food stakeholders paying higher income taxes, their increased consumption leads to an increase in their consumption taxes and their increased investments create increased capital gains tax opportunities for the government.

12. As tariffs are reduced, non-tariffs will become more prominent tools in controlling trade. The most confusing of such tools is the sanitary and phytosanitary measures and other technical barriers to trade such as food safety, quality and biotechnology. The biotechnology area poses most problems given the dichotomy of positions currently prevailing in North America and Europe. Therefore, the Next Round of the WTO should focus on creating processes and definitions that bridge the gap, creating standards for reviewing and approving agricultural biotechnology, and thus removing the potential of nations using the ambiguity of the rules to distort and control trade.

13. Liberalizing agricultural trade under the Next Round of WTO Negotiations increases the total well being of the Canadian economy since the agri-food industries contribute positive net benefits to the economy. Therefore, pursuing trade liberalization objectives at the Next Round is an important and credible objective for Canada's agri-food industries.

8.5 Recommendations on Trade Position

Although it is credible to pursue a trade liberalization objective in the Next Round of WTO negotiations, can Canada's agri-food industries develop a single, clear, sound and compelling position as they go into the negotiations? The question that arises is this:

> How do agri-food stakeholders identify and develop a single, clear, sound and compelling position when they are divided along lines described by the net benefits from trade liberalization?

The results of the analysis show the dichotomy in the net benefits to the agri-food sector: the non-supply managed industries showing positive net benefits while the supply managed industries showed negative net benefits. This may seem to pose a chasm in developing a single position.

Industry positions developed and presented over the past year seem to be very congruent in many ways – ensuring market access, strengthening rules about minimum access implementation, elimination of

domestic and export subsidies (and other support programs) and clarification of SPS and non-tariff barriers. At the Atlantic Trade Seminar held in Dartmouth recently by the Nova Scotia Federation of Agriculture, speaker after speaker from the various industries reiterated the same positions for the Next Round. A position paper presented by the Canadian Alliance of Agri-Food Exporters (CAAFE, 1998), a coalition of about a dozen industry organizations, reinforces this observation. The principal point of contention among the various industries, it may seem, is the rate of reduction of tariffs. While the non-supply-managed industries want them eliminated as quickly as possible, the supply managed industries want them maintained as long as possible.

Our simulations indicated that with the exception of the egg industry, the supply managed industries at the farm level had positive net benefits. This creates another common point among the industries, supporting the development of a single, clear, sound and compelling position for the Next Round. Supply managed industries' processors should work on determining the foundation of their price competitiveness' constraints. It used to be attributed to higher prices at the farm level (ISTC, 1992), but recent and expected long term trends in prices no longer support such arguments. Also, as indicated in Table 8.1, the adjustment costs for the dairy and poultry industries were relatively small, less than 5.5% of base scenario net benefits.[21] Furthermore, the future success of Canada's agri-food industries depends on *current* stakeholders' ability to put their long-term success strategies in perspective given the changes that are evolving around them.

The sector's objective in the Next Round of WTO Negotiations should be to achieve a strong, rules-based international trading system in which success depends on ability to work the market and not the government. This objective transcends industry idiosyncrasies as long as stakeholders recognize the non-reversal of tariffs philosophy among WTO members. Therefore, the foundation of positions on the major issues – market access, export and domestic subsidies, and sanitary, phytosanitary measures and dispute settlement – should be the development and achievement of a strong, transparent, rules-based international trading system.

A cornerstone of a strong, transparent and rules-based system is a high cost for non-compliance. Therefore, Canada should align itself with others to develop a framework that penalized member-countries for non-compliance. This is because non-compliance is a major threat to the generation of benefits under liberalized trade environment. The framework should aim at encouraging all members to commit to the letter and the spirit of the Agreement, creating a true free and fair trade environment for all. The penalty for violating any segment of the Agreement should be high enough to serve as an effective deterrent.

In an environment that has clear, transparent and enforceable trade rules, Canada's agri-food sector leaders agreed that they will be successful in profitably sustaining and enhancing their market share, particularly for high value-added products, in a liberalized trade environment. They indicated they have done it before under the Canada-US Trade Agreement and can repeat it under the WTO.

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[21] Eggs had a significantly higher adjustment costs which is explained by the increasing proportion of breaker eggs and the relatively lower prices of breaker compared to table eggs.

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Appendix

Table 1: Average Annual Net Benefits for the Grain Industries Under the Pause Option

Items	BASE	20-YEAR	10-YEAR
Barley			
Farm Revenue	1,848.70	1,910.49	2,020.74
Farm Cost	830.09	828.77	824.83
Export Revenue	586.00	569.50	583.90
Export Barley Cost	380.90	370.18	379.53
Net Revenue	1,223.71	1,281.04	1,400.28
Net Benefits		***57.33***	***176.57***
Corn			
Farm Revenue	1,116.82	1,139.79	1,185.15
Farm Cost	623.91	624.24	624.57
Export Revenue	0.00	0.00	0.00
Net Revenue	492.90	515.55	560.59
Net Benefits		***22.65***	***67.68***
Wheat			
Farm Revenue	4,339.78	4,416.15	4,566.09
Farm Cost	2,090.60	2,111.85	2,158.30
Export Revenue	3,245.99	3,287.67	3,409.71
Export Wheat Cost	2,337.12	2,367.13	2,489.09
Net Revenue	3,158.06	3,224.85	3,328.42
Net Benefits		***115.85***	***422.69***
Total Grain Net Benefit		**195.82**	**666.94**

Table 2: Average Annual Net Benefits for the Supply Managed Industries Under the Pause Option

Item	BASE	20-YEAR	10-YEAR
Dairy			
Farm Revenue	8,903.30	8,831.33	8,895.88
Processing Revenue	2,897.83	2,653.78	2,648.05
Farm Cost	3,171.51	3,133.54	3,096.39
Processing Cost	215.22	212.76	210.39
Farm Net Revenue	5,731.80	5,697.79	5,799.49
Processing Net Revenue	2,682.61	2,441.01	2,437.66
Total Industry Net Revenue	8,414.41	8,138.80	8,237.15
Net Benefit		***(275.61)***	***(177.26)***
Chicken			
Farm Revenue	2,930.12	2,972.03	2,946.01
Processing Revenue	5,381.35	5,263.87	5,173.60
Farm Cost	1,491.81	1,508.23	1,429.55
Processing Cost	1,128.54	1,141.21	1,083.68
Farm Net Revenue	1,438.30	1,463.79	1,516.46
Processing Net Revenue	4,252.81	4,122.66	4,089.91
Total Industry Net Revenue	5,691.12	5,586.45	5,606.38
Net Benefit		***(104.66)***	***(84.74)***
Egg			
Farm Revenue	733.75	704.61	629.20
Processing Revenue	895.93	844.69	730.85
Farm Cost	257.75	251.82	217.39
Processing Cost	770.44	739.84	660.66
Farm Net Revenue	476.00	452.79	411.81
Processing Net Revenue	125.50	104.85	70.19
Total Industry Net Revenue	601.50	557.65	482.00
Net Benefit		***(43.85)***	***(119.49)***
Total Net Benefit		**(424.12)**	**(381.49)**

Table 3: Average Annual Net Benefits for the Oilseed Industries Under Pause Option

Item	BASE	20-YEAR	10-YEAR
Canola			
Farm Revenue	2,048.50	2,135.79	2,297.70
Export Revenue	953.24	993.59	1,068.83
Export Canola Cost	857.92	894.23	961.95
Domestic Meal Revenue	211.52	220.59	237.32
Domestic Oil Revenue	311.56	327.47	352.31
Export Meal Revenue	74.23	77.40	83.27
Export Oil Revenue	1,176.31	1,263.17	1,439.44
Farm Cost	512.35	538.50	579.36
Farm Net Revenue	1,536.15	1,597.29	1,718.34
Processing Net Revenue	982.13	1,043.67	1,163.05
Total Industry Net Revenue	2,518.29	2,640.95	2,881.39
Net Benefit		***122.66***	***363.10***
Soybean			
Farm Revenue	725.95	744.94	771.68
Export Revenue	171.96	176.46	182.78
Export Soy Cost	154.77	158.81	164.51
Domestic Meal Revenue	7.65	7.85	8.13
Domestic Oil Revenue	25.09	25.75	26.67
Export Meal Revenue	349.83	358.95	371.78
Export Oil Revenue	164.94	169.24	175.29
Farm Cost	313.02	313.36	313.87
Farm Net Revenue	412.93	431.58	457.81
Processing Net Revenue	290.95	298.54	309.21
Total Industry Net Revenue	703.89	730.12	767.03
Net Benefit		***26.23***	***63.14***
Total Oilseed Net Benefit		**148.90**	**426.25**

Table 4: Average Annual net Benefits for the Red Meat Industries Under the Pause Option

Item	BASE	20-YEAR	10-YEAR
Beef			
Farm Revenue	5,030.20	5,337.11	6,016.12
Processing Revenue	6,223.07	6,598.86	7,429.78
Farm Cost	2,896.57	3,003.38	3,235.56
Processing Cost	4,960.82	5,264.65	5,965.06
Farm Net Revenue	2,133.63	2,333.73	2,780.55
Processing Net Revenue	1,262.25	1,334.21	1,464.72
Total Industry Net Revenue	3,395.88	3,667.94	4,273.40
Net Benefit		***272.05***	***877.51***
Pork			
Farm Revenue	2,714.07	3,129.67	3,292.11
Processing Revenue	5,574.53	6,298.23	6,442.53
Farm Cost	2,509.75	2,748.41	2,783.83
Processing Cost	3,077.55	3,527.02	3,694.56
Farm Net Revenue	204.33	381.26	508.28
Processing Net Revenue	2,496.98	2,771.21	2,747.97
Total Industry Net Revenue	2,701.31	3,152.47	3,256.25
Net Benefit		***451.17***	***554.95***
Total Net Benefit		**723.22**	**1,432.46**

Table 5: Summary of Total Average Annual Net Benefits Under the Pause Option

Industry	20-YEAR	10-YEAR
Barley	57.33	176.57
Beef	272.05	877.51
Canola	122.66	363.10
Chicken	(104.66)	(84.74)
Corn	22.65	67.68
Dairy	(275.61)	(177.26)
Eggs	(43.85)	(119.49)
Pork	451.17	554.95
Soybean	26.23	63.14
Wheat	66.80	170.37
Total Net Benefit	**594.77**	**1,891.83**

Table 6: Price Elasticities of Supply Used in Base Scenario (Roningen and Dixit, 1989)

	Beef	Pork	Milk	Eggs	Chicken	Wheat	Corn	Barley	Soybean	Canola
Beef	0.5	-0.3					-0.02	-0.04		
Pork	-0.05	1.5			-0.05	-0.24	-0.15	-0.23		
Milk	0.04		0.45					-0.01		
Eggs				0.5		-0.19	-0.02	-0.03		
Chicken		-0.09			0.7	-0.27	-0.04	-0.05		
Wheat						0.5		-0.15		-0.15
Corn							0.23		-0.03	
Barley						-0.33		0.75		-0.11
Soybean							-0.09		0.35	
Canola						-0.34		-0.05		0.85

Table 7: Price Elasticities of Supply Used in the 20-Year Sunset Scenario

West										
	Beef	Pork	Milk	Eggs	Chicken	Wheat	Corn	Barley	Soybean	Canola
Beef	0.6	-0.3					-0.02	-0.04		
Pork	-0.05	1.55			-0.05	-0.24	-0.15	-0.23		
Milk	0.04		0.45					-0.01		
Eggs				0.91		-0.19	-0.02	-0.03		
Chicken		-0.09			1.1	-0.27	-0.04	-0.05		
Wheat						0.5		-0.15		-0.15
Barley						-0.33		0.45		-0.11
Canola						-0.34		-0.05		1.1
East										
Beef	0.5	-0.3					-0.02	-0.04		
Pork	-0.05	1.5			-0.05	-0.24	-0.15	-0.23		
Milk	0.04		0.45					-0.01		
Eggs				0.9		-0.19	-0.02	-0.03		
Chicken		-0.09			1.0	-0.27	-0.04	-0.05		
Corn							0.23		-0.03	
Soybean							-0.09		0.35	

Table 8: Price Elasticities of Supply Used in the 10-Year Sunset Scenario

West										
	Beef	Pork	Milk	Eggs	Chicken	Wheat	Corn	Barley	Soybean	Canola
Beef	0.8	-0.3					-0.02	-0.04		
Pork	-0.05	1.7			-0.05	-0.24	-0.15	-0.23		
Milk	0.04		0.45					-0.01		
Eggs				1		-0.19	-0.02	-0.03		
Chicken		-0.09			1.2	-0.27	-0.04	-0.05		
Wheat						0.5		-0.15		-0.15
Barley						-0.33		0.5		-0.11
Canola						-0.34		-0.05		1.25
East										
Beef	0.6	-0.3					-0.02	-0.04		
Pork	-0.05	1.6			-0.05	-0.24	-0.15	-0.23		
Milk	0.04		0.45					-0.01		
Eggs				0.95		-0.19	-0.02	-0.03		
Chicken		-0.09			1.1	-0.27	-0.04	-0.05		
Corn							0.23		-0.03	
Soybean							-0.09		0.4	