PROSPECTS FOR EXPANDED EGG PRODUCTION IN WESTERN CANADA

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October, 1998

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Executive Summary

This research project is an assessment of potential competitiveness of the egg industry in Manitoba compared to other western provinces, eastern Canada and the US.

Domestic and world market potential for eggs is analysed in terms of current consumer preferences and potential changes in consumer perception of health and dietary issues related to egg consumption. Evidence shows that demand for eggs is changing. Processed eggs are gaining share in total egg consumption and in addition are contributing to an apparent shift in demand for eggs. The analysis indicates that demand for processed eggs is expanding very rapidly.

Japan and Hong Kong are the main offshore importing markets, and will remain as such for some time, given the current tariff levels on imports into the EU. The main exporting countries are the US, and China. India appears to be another potential competing country. Even though the US is the main exporting country, it represents the main export market for Canadian eggs. Further international trade liberalization creates opportunities for expanded markets, but at the same time it opens the domestic market to foreign competition. Canada is seen as one of the major targets for US egg exports. To be able to compete in the domestic market as well as in foreign markets, it is necessary to rely on efficient sizes of operations and on progressive technologies. The analysis shows that there are deep differences between the US and Canadian egg industries in terms of size of egg production operations and capacity of egg processing facilities.

Using standard budgets for two egg production operations, production costs were compared for five provinces in Canada and the top five egg producing states in the US. This comparison is based on the main components of egg costs, including feed, labour, depreciation and interest costs. The results show that Alberta and Saskatchewan represent the lowest cost for egg production (56 cents per dozen). Iowa follows with only one more cent per dozen. Manitoba, Ohio and Indiana are all in the range of 58 cents per dozen. The cost comparisons assumed the same productivity for US and Canadian hens. Historically Canadian productivity has been higher. If this advantage can be maintained in the future, then the Canadian cost advantage may be higher than was calculated here.

When comparing the individual components of production costs, it becomes clear that the main advantage for the western provinces relies on feed costs. This advantage may be attributed to the recent removal of the western grain transportation subsidy, and also to the feed rations used in the west, which include wheat and barley instead of corn. When comparing feed costs among the prairies, Manitoba appears to have a disadvantage, given the high price of feed wheat. Corn Belt states in the US have lower feed costs than eastern Canadian provinces. The main advantage for the US relies on relatively lower construction costs compared to the Canadian provinces. However, this advantage is diminished when considering higher US interest rates.

The Canadian egg processing industry is limited by the size of its operations. Compared to US competitors, Canadian egg processors do not enjoy the benefits of economies of scale. Evidence shows that Canadian margins at the processing level are much lower than the US margins.

Increased concentration of egg production in a given region increases the exposure to various diseases for humans and other living species. The prairies enjoy a competitive advantage compared to other regions, given the crop land available for manure disposal. However, an increasing concern is the high concentration of livestock production around cities, which implies increased costs related to manure transportation.

Feed grain supply is considered to be a constraint for expanded egg production. One of the solutions suggested in this report is to ensure a constant supply of feed grains through introducing the idea of growing grains especially for feed use and not consider feed grains as a mere residual of human grain consumption.

Prospects for Expanded Egg Production in Western Canada

1.0. Introduction

The removal of the Western grain transportation subsidy, combined with increased demand for processed egg products and falling tariffs in export markets, suggest increased opportunities for processing (breaker) egg production in Canada and create the perception that the industry could be expanded.

However, this perception has not been analysed in a systematic way. The changing situation raises a number of relevant questions:

- What are the likely market prospects for processed egg products in the world market?
- What is the situation in competitor countries?
- How do the various regions of Canada compare in production cost with the US and other competitor countries?
- What are the implications of the egg processing industry's structure and location for Manitoba's and Canada's competitiveness?
- What are the impeding factors for expanded egg production in Canada, and what are the relative positions of various regions? For example, will expansion of livestock production eventually reduce any cost advantage from being a surplus feed grain producer?

The general objective of this project is to assess the potential competitiveness of the egg industry in Manitoba compared to other western provinces, eastern Canada and the US. The specific objectives are:

- To assess the international market potential for eggs.
- To compare production costs for eggs in Canada to other countries.
- To assess the potential effects of the changing structure of Canada's egg processing industry on the relative competitiveness of the egg industry.
- To address the potential impacts on Canada's competitiveness of issues such as environment, food safety, and feed grains supply.

The remainder of this report is built around these objectives. The next section represents an assessment of market potential for eggs and egg products. Section three is an analysis of major cost components of egg production, and section four analyses competition at the processing level. A summary of constraints for expanded production follows in section five, with special emphasis on environmental regulations and feed grain supply.

2.0. Assessing Market Potential For Processed Egg Products

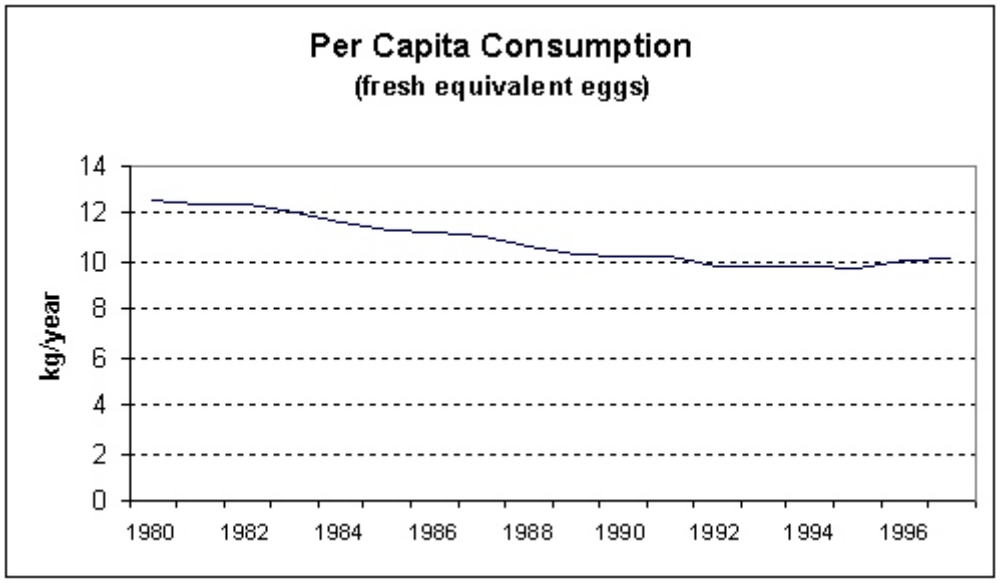
In this section, the market potential for processed egg products is assessed. We begin by analysing trends in the domestic market and then expand the discussion to world markets in terms of importing patterns of the major importing countries, growth in real income as well as commitments on reductions of trade barriers. An assessment of competitors follows, with the focus on North American production.

2.1. Domestic Market

2.1.1. Per Capita Consumption

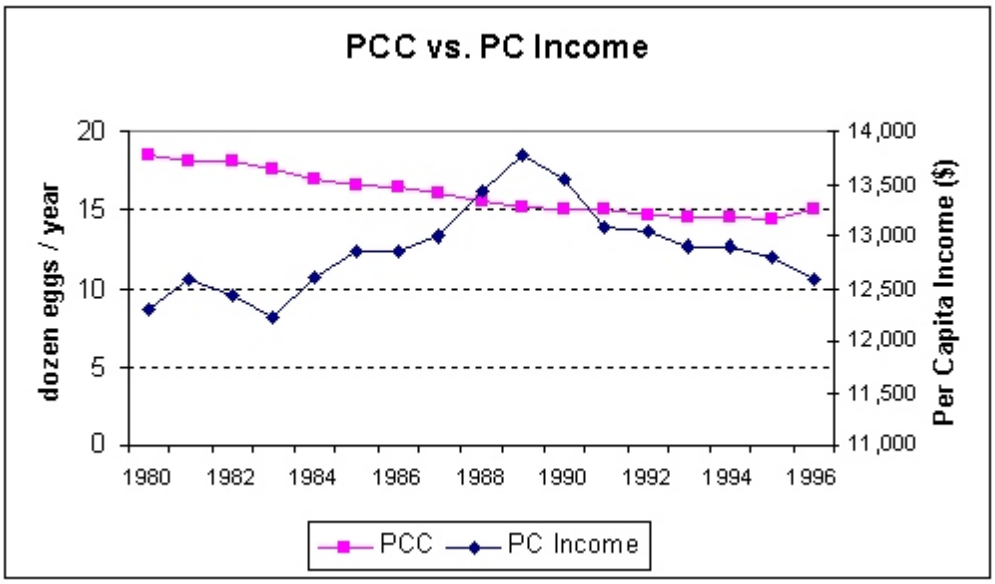
As shown in Figure 2.1, Canadian per capita egg consumption declined from 1980 until 1990. Subsequently, consumption levelled and then turned in 1996, when a slight increase occurred. Historical information shown in Figure 2.2 suggests that there has been no relationship between per capita income and per capita egg consumption.

Figure 2.1. Historical Per Capita Consumption of total eggs in Canada



Source: Statistics Canada, Matrix 2266, Matrix 2480.
PCC - Per Capita Consumption

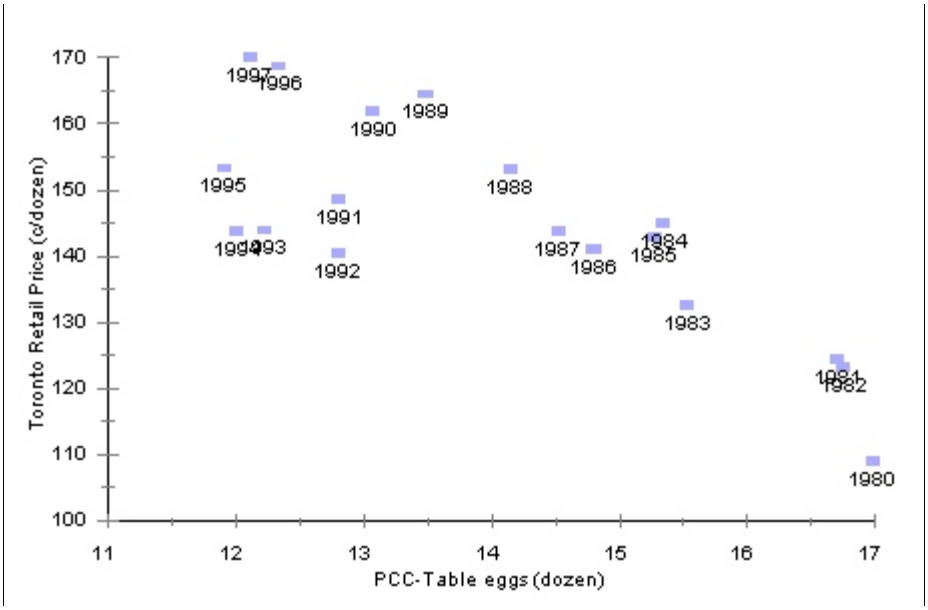
Figure 2.2. Influence of Per Capita Income on Egg Consumption



Source: Statistics Canada

The decline in egg consumption is more likely to be determined by health concerns regarding issues such as dietary cholesterol. This is supported by Figure 2.3 where it is easy to see a shift in demand for table eggs during the past decade. Between 1991 and 1995, for the same price as during the eighties, consumers were willing to buy fewer eggs. The data in Figure 2.3 suggest that another shift may now be occurring. This time the shift is in the opposite direction. Demand for eggs in 1996 and 1997 seems to be moving back to where it was in the eighties, thus suggesting that demand is increasing. It may be that this is related to recent findings that dietary cholesterol in food is not directly transformed into blood cholesterol, and/or to the introduction of eggs with high levels of Omega-3 fatty acids. So in the future one might expect to see higher per capita consumption of eggs at current price levels or higher prices at current consumption levels.

Figure 2.3. Shifts in Consumer Demand for Table Eggs



Sources: Annual Poultry Market Review
CEMA information received by fax.

2.1.2. Table Eggs vs. Processed Egg Products

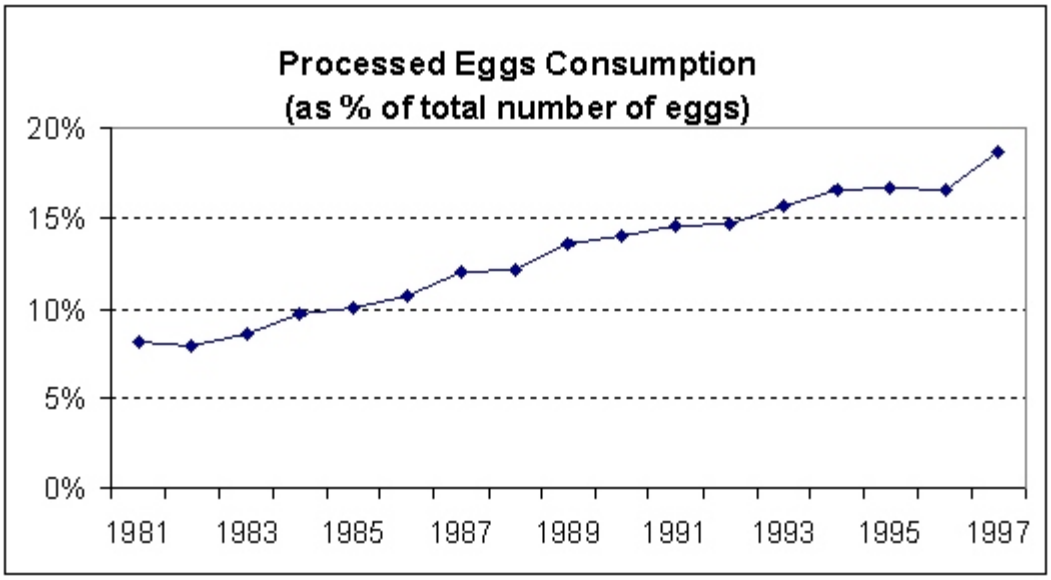
Eggs used in processing were historically those that did not make grade requirements or, especially in Canada, those that were surplus to table consumption. However, there is increased interest in producing eggs for processing only. End use destination may be an important factor in determining the time hens enter production because there is a tradeoff between egg size and number of eggs per hen during the hen's life. The earlier the hens enter production, the smaller is the average egg size during the whole life of the bird. However, in the case of processed eggs, size is not a restriction. It is possible that the same or a larger amount of egg mass production can be ensured if the right time is picked so that the increased number of eggs compensates for the decrease in egg size. However there is no study to support this idea and in practice hens enter production at the same time, no matter what is the end use.

This explains recent initiatives in Manitoba which consist of specifically designed operations for industrial egg production as opposed to considering industrial eggs a residual to the table egg market. This can be considered as a result of the dual market and of the desire to maintain a dual price system.

Processed egg production as a portion of total egg production is growing in Canada. In 1997 about 18 percent of total egg production was represented by eggs for processing (Figure 2.4), up from about eight percent in the early 1980's. There is wide variation among the provinces, with Manitoba at over 50 percent of eggs. Moreover, the Manitoba Egg Producers has introduced a

"Grow for Processing" program, which is expected to enhance the production of eggs for the processing industry.

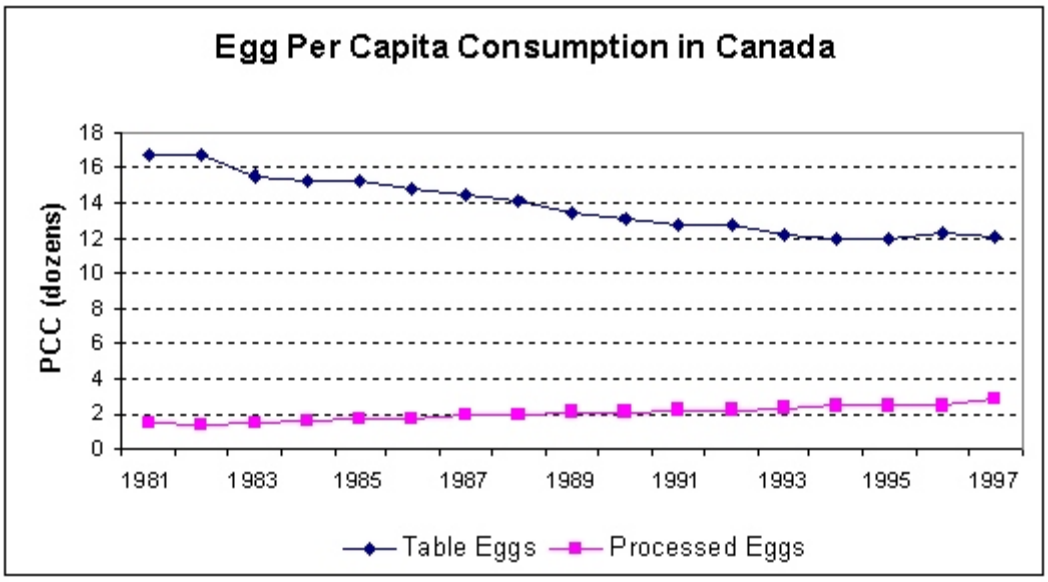
Figure 2.4. Increased Interest in Processed Eggs in Canada



Source: CEMA

While table egg consumption has been decreasing steadily over the past 15 years, processed eggs have seen a constant increase in per capita consumption (see Figure 2.5). As can be seen, the period from the mid-1980's through 1995 shows the same decline in demand as we saw when total per capita consumption was analysed. However, using only table egg consumption, the possible shift back to the right of the demand relationship is not so evident. Hence, the apparent increase in demand the past couple of years may, in fact, reflect increased demand for processing eggs.

Figure 2.5. Trends in consumer preferences



Source: CEMA

The substitution of processed eggs for table eggs seems to be a general tendency in North America. In the United States, processed eggs increased from 15 percent of total egg production to 29 percent during the past 15 years. A survey conducted by Egg Industry in 1998, indicates that the majority of large egg producing companies in the US plan to increase the portion of eggs that goes for breaking.

Recent innovations at the processor level have contributed to increased quality and more variety of convenience foods prepared with eggs. In addition, as mentioned above, consumer perception of negative dietary attributes of eggs is changing as a result of the recent findings related to dietary cholesterol. As a result of these recent developments at both the consumer and processor level, processed egg products are becoming far more attractive to consumers than ever before. It is perceived that, while table eggs enjoy the majority of egg production, processed egg products represent the main source of growth in the future. Industry analysts in the US indicate that the percentage of eggs being broken is "growing quickly toward the once-deemed-impossible 50 percent of production".[1]

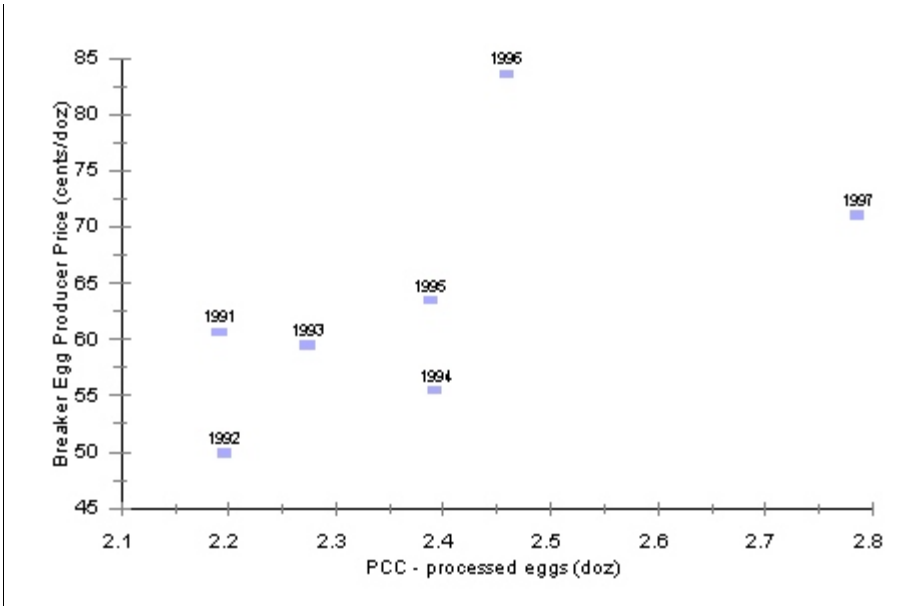
Processed egg products represent an opportunity for growers or others to expand into higher value added production. Recently egg producers in Ontario have formed an egg processing cooperative intended to enhance members' incomes by processing profitably. In addition they

[1] Source: Egg Industry - January 1998

are seeking joint venture partners in the further processed egg industry. [2]

As suggested above, the growth in processed egg production and consumption has affected the apparent demand structure. Data suggest that the demand for processing eggs is quite strong. Unfortunately, there is no representative retail price series for "processed eggs", which would be expected given the great diversity of end uses for the product. Thus it is not possible to show per capita consumption of processed eggs against retail prices to examine consumer demand. However, as a proxy for retail prices we plotted producer prices against annual per capita consumption of processing eggs in Figure 2.6. Doing this shows processor - ie "derived" demand for processing eggs. The resulting data show that per capita consumption and price are positively correlated - that is, processors buy more at higher prices. This is consistent with very rapidly expanding demand for use in processed products, and suggests again that the greatest growth opportunities may be in eggs for processing.

Figure 2.6. Derived Demand for Processed Eggs



Source: CEMA, Statistics Canada

A recent consumer survey conducted by Struman and Associates[3] in the US found that above 70 percent of respondents preferred that further processed products contain eggs as opposed to egg replacement products and only 18-19 percent preferred egg replacement products. As

[2] Source: "Egg co-op wants to crack industrial market", *Farm and Country*, June 1998.

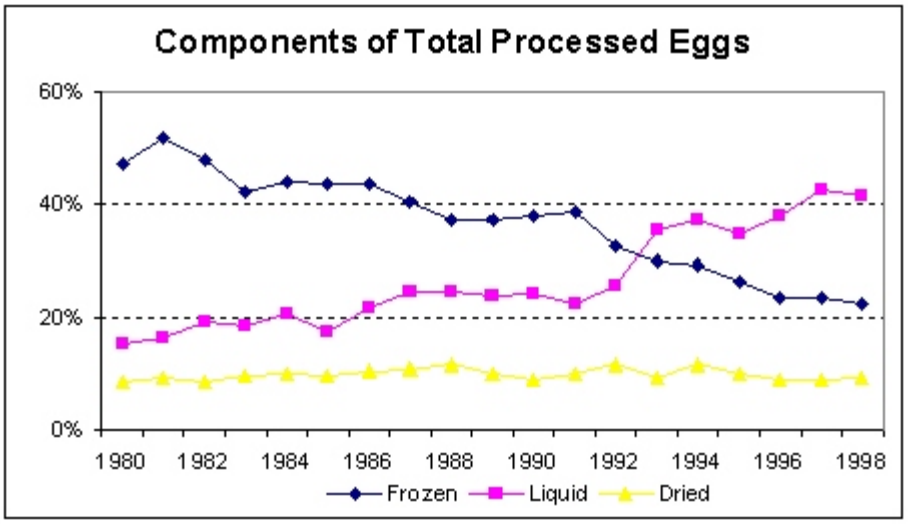
[3] See Egg For Industry (California Egg Commission) Web Page: http://eggs4industry.com/study.html

convenience foods grow, egg products are expected to grow with them given the current state of consumer preferences.

While markets clearly seem to be signalling increased attention to eggs for processing, the Canadian system poses many complications represented by the national price pooling and levy system. As a result, any increase in production of eggs for processing is not a simple management decision because of the conflicting interests of many groups involved.

It is of interest to note the components of total processed egg production. Dried eggs have maintained their position at about nine percent of processed eggs, while liquid eggs more than doubled their share since 1980, climbing from 15 to 41 percent of total processed eggs. Frozen eggs declined from 47 percent in 1980 to 22 percent in 1997 (see Figure 2.7).

Figure 2.7. Relative Positions of Processed Egg Products in Canada



Source: Statistics Canada

Eggs for export represent a slightly different picture. In 1997, processed eggs represented 27 percent of total value of export eggs[4]. The major destination for Canadian exports is the US. Future increases in exports may come from the US or from expansion in overseas markets. The latter will result from improved access to markets (see section 2.2), and this will definitely increase the share of processed eggs in total egg exports, given the relative ease of transporting broken eggs compared to eggs in shell.

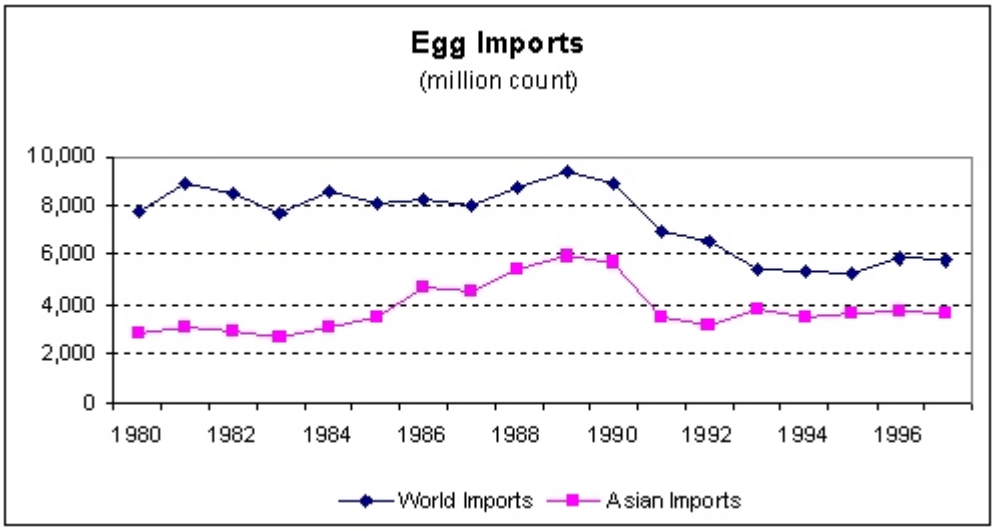
[4] Source: Strategis, Trade Data on Line (http://strategis.ic.gc.ca/cgi-bin/tdst-bin/wow/wow.start_application?)

2.2. World Market

2.2.1. Import Patterns in Major Importing Countries

Figure 2.8 contains world (excluding intra- European Union trade)[5] and Asian import levels for all egg products since 1980. The data show that world trade peaked in the late 1980's, declined, and then has been essentially flat since.

Figure 2.8. World and Asian Egg Imports



Source: USDA PS&D database

The same general pattern exists for Asian imports, except that the trend has been slightly stronger. This is reflected in the import shares that are shown in Figure 2.9, which show that Asia counts for the majority of egg imports. Japan and Hong Kong represent 94 percent of Asian imports.

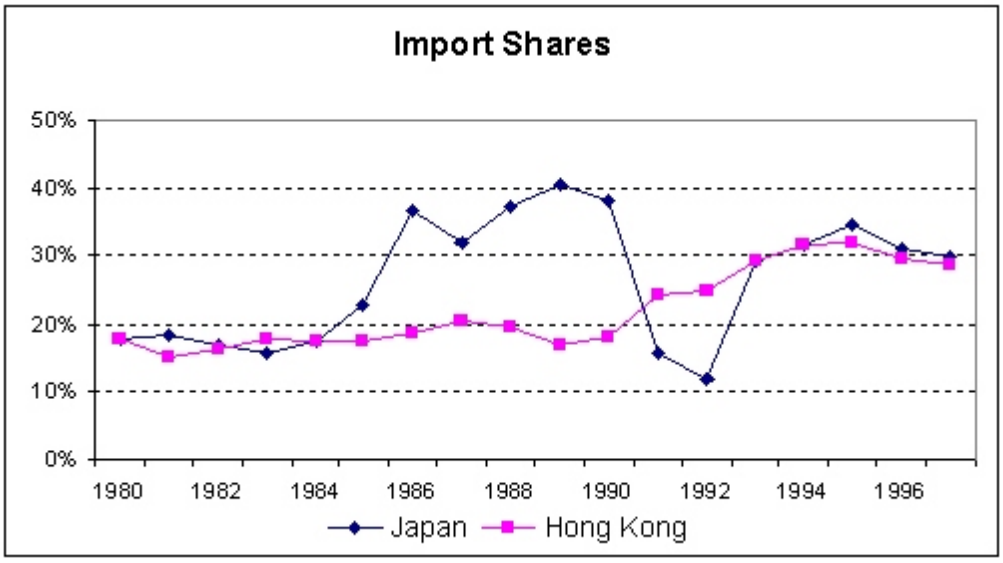
[5]We exclude the EU because their trade barriers and agricultural policies create synthetic internal markets and essentially preclude imports from non-EU sources. In the future, if there is continued progress in international trade agreements, it may be easier to compete with and in the EU countries and it may be possible to replace intra EU imports with imports from non-EU countries. This is because our definition of "progress in international trade agreements" means further reduction of import barriers, production subsidies or export subsidies. If this occurs, there will be fewer distortions in production and trade, and non-EU countries will have a better chance to compete with and in the EU.

Figure 2.9. Egg Import shares by Region

Source: USDA PS&D database

As shown in Figure 2.10, Hong Kong imports have been growing during the past decade. Imports represent the major source of eggs in Hong Kong. As will be suggested below, the return of Hong Kong to China is likely to mean that Hong Kong will be supplied by China instead of offshore suppliers. Domestic production in Japan is the major source of eggs and imports represent only four percent of total domestic consumption since 1993.

Figure 2.10. Egg Import Shares: Japan and Hong Kong



One limitation of the import data available is that the data do not distinguish between trade in shell eggs and the various forms of processed product. Since the advent of more processing, as explained above, it would be expected that a growing share of the international trade is and will be in the processed categories. Hence even though the overall growth in imports has been small, the opportunity for growth in processed trade may be large.

2.2.2. GDP growth in Importing Countries

As shown in the previous section, Japan and Hong Kong represent the majority of world egg imports. Since Hong Kong has been returned to China, it is unlikely that there will be separate Hong Kong data in the foreseeable future. As discussed below, at least in the short run, it would appear that Hong Kong will likely be supplied by Chinese producers.

That leaves Japan as a major importer and the question arises whether it will maintain this position given the current Asian financial crisis. The IMF projections[6] of GDP growth rates seem to be optimistic for Japan in 1999 (see Figure 2.11). The projected rates for 1999 are no longer negative and this is an improvement from 1998 projections. We cross-checked these rates with USDA forecasts[7]. While for 1998 USDA foresees a smaller rate of decrease in Japan's real GDP, for 1999 the USDA forecast is three times higher than the IMF forecast (1.5 percent). In other words both sources suggest a potential turnaround from this year's extremely poor performance in Japan. If these forecasts are accurate, it should bode well for North American exports of eggs and other food products. However, the authors' experience of the past year is that USDA has been consistently over optimistic in their forecasts of Asian imports.

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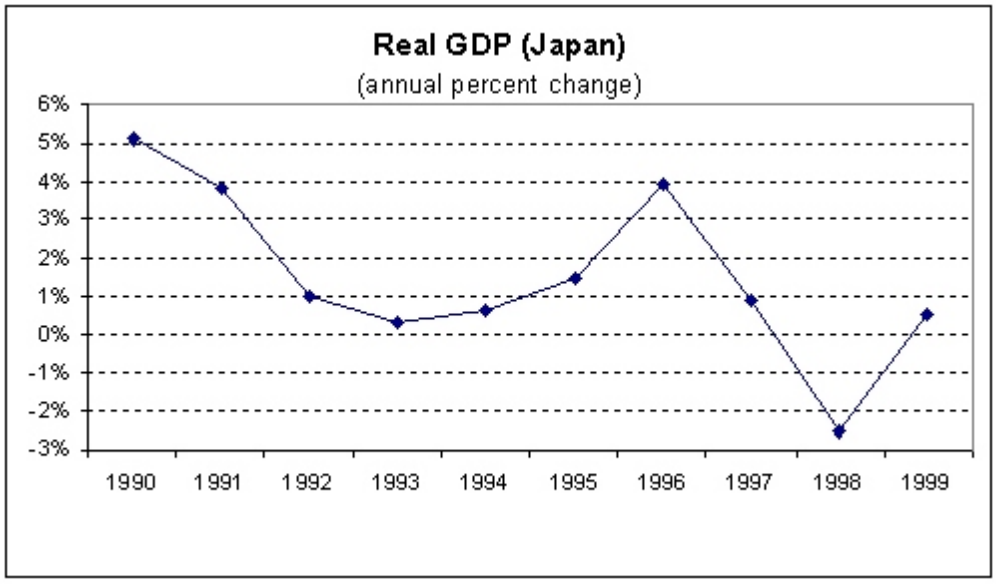
[6] Source: "World Economic Outlook" - IMF - September 1998. Discussions with personnel at the IMF resulted in the feedback that they do not make forecasts longer term than the ones shown.

[7] Source: "Agricultural Outlook", Economic Research Service/USDA, September 1998.

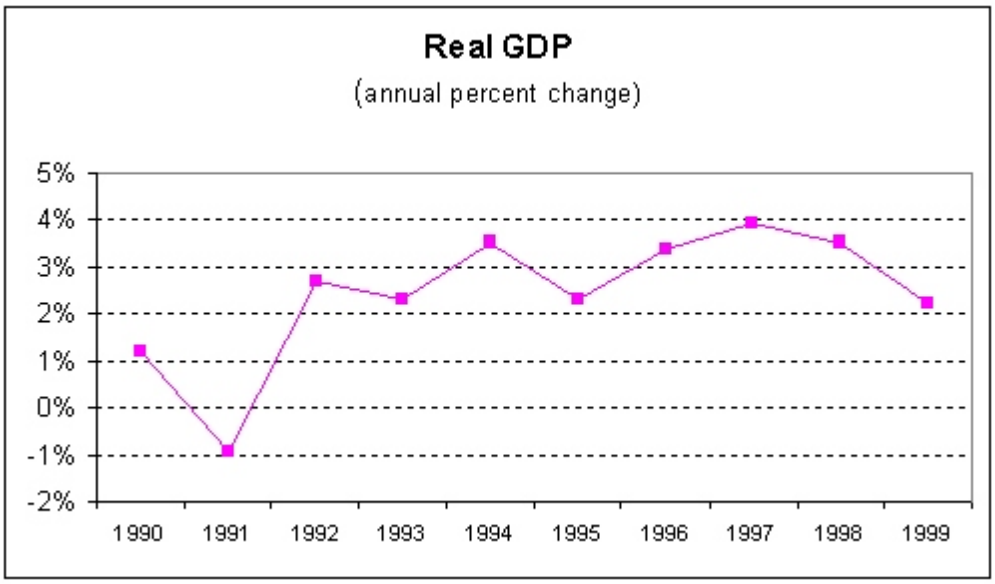
Figure 2.11. Real GDP Growth Rates - Japan



Source: "World Economic Outlook" - IMF - May 1998
"World Economic Outlook" - IMF - September 1998

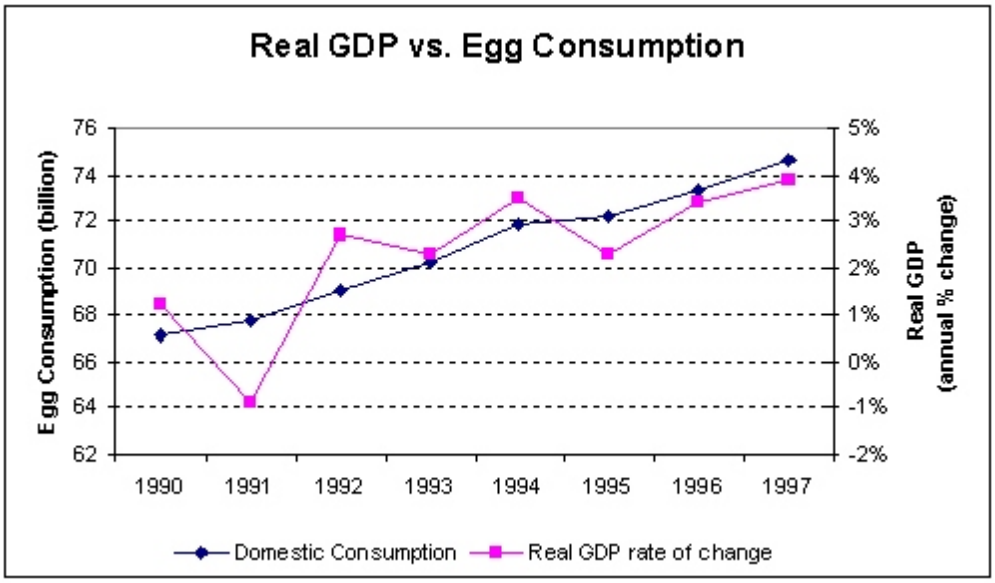
In addition, it is of interest to note that the US market is currently the main export destination for Canadian eggs. The annual growth rate of GDP in the US is forecast to slow down in 1999 as shown in Figure 2.12. A quick look at historical information shows that there appears to be a close relationship between real GDP and domestic egg consumption in the US (as shown in Figure 2.13). This might imply a slower increase in US domestic egg consumption for the coming years.

Figure 2.12. Real GDP growth rates - US



Source: ERS/USDA "Agricultural Outlook" September 1998.

Figure 2.13. GDP influence on Domestic Egg Consumption - US



Sources: USDA PS&D database
ERS/USDA "Agricultural Outlook" September 1998.

2.2.3. Commitments to Reduce Trade Barriers

The past decade has seen three major trade treaties: Canada/US, NAFTA and WTO. These have altered trade barriers significantly. Canadian tariffs presented at the conclusion of the Uruguay Round of GATT are intended to protect supply managed industries in Canada. Canada's minimum access commitment (Tariff Rate Quota (TRQ)) for table eggs and egg products will be 21.37 million dozen by year 2000.[8] Imports under this level are considered too small to disrupt the Canadian market. Canadian tariff rates for imports under this level are considerably lower than tariff rates on imports above the TRQ level.

Tariff rates on imports over the TRQ levels are scheduled to be reduced by 15 percent in year 2000 from their pre-1995 levels. They are designed to make imports of eggs and egg products uneconomical, in order to protect the domestic egg industry. Table A.1. in Appendix A gives tariff equivalents and specific tariff rates on eggs and egg product imports into Canada for quantities higher than the TRQ level. These tariffs apply to all countries, including the US.

As shown in Table A.2 in Appendix A, the US commitment is to reduce its tariffs on eggs and egg product imports by 20 percent year 2000. These tariffs apply to all imports into the US except those from Canada and Mexico because of the NAFTA Treaty.

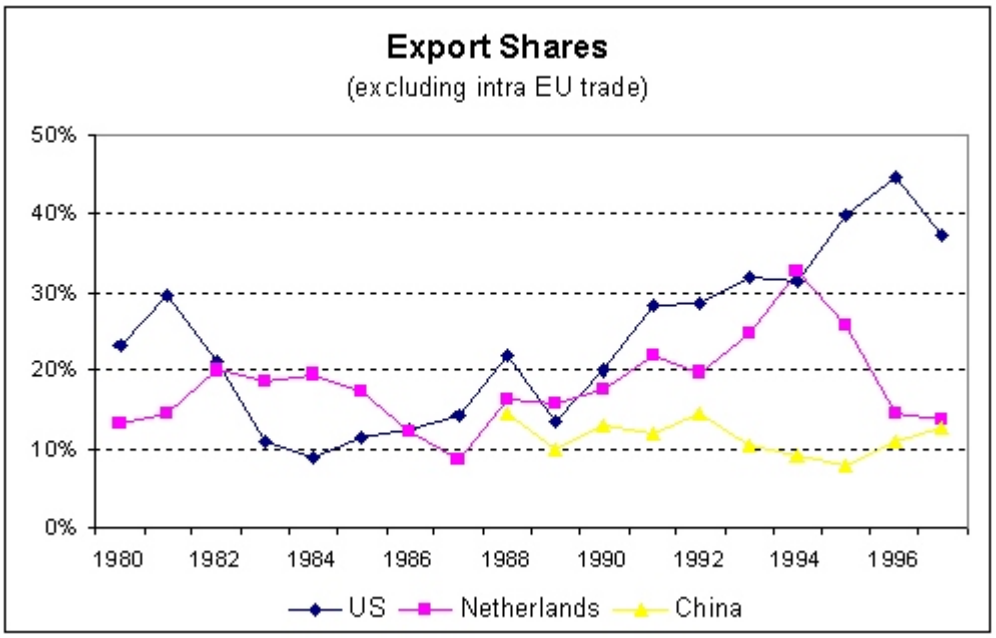
The EU commitment is to reduce tariffs on eggs and egg product imports by 36 percent (see Table A.4.). This coincides with the commitment for the average reduction of tariff barriers on all agricultural products in developed countries. Based on tariff commitments for year 2000, it will remain next to impossible to export into the EU. A simple comparison of specific tariff rates between the US and EU (using 1998 exchange rate of 0.86 ECU/US$) shows that even with a higher percentage reduction, the EU still will impose tariff rates that are three to eight times higher than the US tariffs. These plus EU technical barriers are the main reasons we do not expect that the EU market will be very attractive over the next few years.

2.3. Assessing the Competitors

This section is an overview and assessment of the competitor countries. The major egg exporting countries are the US, the Netherlands, China, and India (beginning in 1997). Figure 2.14 and Table 2.1 give the market shares of these countries (in percent of total volume of exports excluding intra EU trade). Canadian exports represented only 5.5 percent[9] of world exports in 1997 (excluding intra EU trade).

[8] Access for egg products is calculated on an egg equivalent basis.

[9] Canada is a net importer of eggs.



Source: USDA, PS&D database

Table 2.1. Export Shares by Country of Origin
(% of world egg exports excluding intra EU trade)

	US	Netherlands	China	Canada	India
1992	28.6%	19.8%	14.6%	6.2%	0.3%
1993	32.0%	24.8%	10.5%	7.0%	0.4%
1994	31.6%	32.7%	9.1%	4.1%	0.8%
1995	39.7%	25.7%	7.9%	5.4%	0.3%
1996	44.7%	14.5%	11.1%	5.8%	0.7%
1997	37.2%	13.7%	12.7%	5.5%	7.6%

US exports represent only one percent of its domestic egg production. This implies that there is potential for export growth. In the nineties, US egg exports experienced an exceptional increase. While both components of egg exports (eggs in shell and egg products) increased significantly, egg products rose 190 percent from 48 million dozen in 1990 to 139 million dozen in 1996.[10] As a result, US egg product exports gained markedly relative to shell egg exports. In 1997, egg products represented 36 percent (from 25 percent in 1993) of total value of US egg exports. This is explained by changing lifestyles, the trend toward convenience food products, and lower transportation costs for egg products. 1997 was not a good year for US shell egg exports, mainly

[10] Source: "Agricultural Outlook: US Egg Production on the Sunny Side in the 1990's", Economic Research Service/USDA, May 1997.

due to higher Chinese competition in the Hong Kong market when the latter became part of China. However, US exports of liquid and frozen eggs increased.

EU-15 exports to the world represent 20 percent of total exports. The most important exporting countries in the EU are the Netherlands and Germany (with13.7 and 2.1 percent of world exports in 1997). India has an increasing presence in the international egg market. In 1997 Indian egg exports amounted to 7.6 percent of total exports. What is of interest about India is not its market share per se, but the size of its increase in the past year from an historical level of less than one percent.

The following table compares basis production and price statistics between the US and Canada. The first notable difference between the two is that hen productivity is higher in Canada than in the US. This likely results from the fact that Canadian production quota has traditionally been administered on a per bird basis. Therefore, there has been incentive to maximize productivity. The second difference is the retail-farm price margins in the two countries. They are calculated using average Ontario and US producer prices for grade A large table eggs[11], and average US and Ontario retail prices. Margins are expressed as percentages of the farm price. They reflect relative market power of egg producers. The Canadian egg industry is protected by high import barriers and, as a result, Canadian retail/farm price margins are considerably lower than US margins. With further liberalization of international trade, it may be expected that Canadian margins would increase at least as a percentage of the farm price.

Table 2.2. Egg Production Statistics Canada vs. US

	1995	**1996**	**1997**
Canada			
Egg yield per bird per yr	264.3	268.1	269
Retail-farm price margin	23%	18%	36%
USA			
Egg yield per bird per yr	253	255	255
Retail-farm price margin	74%	65%	83%

Sources: International Egg Commission Web Page, Country Reports.
Statistics Canada

The top five egg producing states in the US are Ohio, California, Iowa, Indiana, and Pennsylvania. They represented about 50 percent of egg layers in 1997. The number of egg producers has been declining sharply in the US. In 1996 there were 900 egg operations, but the vast majority of layers (94 percent) were located on 345 operations with more than 75,000 hens each. Large operations seem to be the future of egg production in the US. They supply more

[11] Levy is not removed.

than 50 percent of eggs, but only five percent of producers own operations with 1 million or more hens.

As shown above, there are deep differences within the US egg industry. Further international trade liberalization creates opportunities for expanded markets, but at the same time it opens the domestic market to foreign competition. Canada is seen as one of the major targets for US egg exports. To be able to compete in the domestic as well as in foreign markets, it will be necessary to be cost competitive in Canada and/or to somehow differentiate Canada's product so it commands higher value.

2.4. Summary

This section leads to a number of inferences:

1. The demand for table eggs in Canada declined during the 1990's, although there is evidence that this has changed the past two years, in part because of the introduction of Omega - 3 products

2. The demand for processing eggs in Canada has been very strong and seems to be increasing.

3. International trade in eggs and egg products has been relatively flat during most of this decade. While the trade data are not reported in a way that allows an assessment of the growth in product form, US export data indicate a large shift from selling in-shell eggs to selling egg products in the international markets. Since the US is the largest exporter, this likely infers that substantial growth potential remains for egg products, even if total trade remains flat.

4. Asia has the fastest growing share of imports, although the re-entry of Hong Kong into China in 1997 may change this. On the other hand, consumption is tied to income growth, so economic growth may lead to more trade in the future.

5. To date, Canada's major export market has been the US. Even though the US is an exporter, geography, its size and proximity to Canada makes it a logical destination for Canadian product.

6. Putting all of the information together, Canada's extremely small size in terms of production means that even in a flat export market, there is a market opportunity for Canadian product if it can be offered competitively, either on the basis of cost or added value. We saw above that Canada has approximately one dozen per year advantage over the US in terms of hen productivity. In the next section we examine the potential for cost competitiveness.

3.0. Comparing Costs of Producing Eggs

The analysis in this section is aimed at discovering systemic cost differences across regions and countries and the relative importance of various cost components for eggs. The information used to build our scenarios is not based on national or regional averages of actual costs. Instead, we assume that a standardized operation based on advanced technology available is constructed in each region. Then budgeted costs are developed based on factor prices in each region.

Among the United States, the top five egg producing states were chosen for cost comparisons, namely Ohio, California, Iowa, Indiana, and Pennsylvania. Western Canada is represented by Manitoba, Saskatchewan, and Alberta. While Ontario and Quebec appear to be similar in many ways, we treated them as comparator regions representing eastern Canada.

3.1. Assumptions

3.1.1. Assumptions on production systems used

When comparing production costs among countries and provinces, it is reasonable to apply the same technology everywhere. This is based on the assumption that a global investor would choose the best technology available no matter where the production unit is to be located. The investor would then search to find the most cost effective location.

Two farm models are used for cost comparisons:

- a single 1 million layer operation, and
- an operation with150 thousand layers

The one million layer operation is designed based on the US experience, and the details are taken from a paper prepared by Donald Bell at the University of California[12]. This is an in-line egg production complex, including pullet rearing, feed mixing, on-site egg grading and packing. The size of operation is dictated by the capacity of egg packaging equipment (wash, candle, size and carton). This equipment represents a major component of initial investment, and in order to keep unit costs down, the size of operations should allow for full utilization of egg packaging capacity.

As Bell indicates, labour requirements related to this farm model are as follows:

• House caretakers	5
• Egg packaging (cartoning)	10
• Management and bookkeeping	2
• Pullet rearing	6
• Feed milling	2
• Repair and maintenance	1
Total	26

[12] Donald Bell "The modern in-line egg production complex - design guidelines", Poultry International, July 1993.

All these jobs are assumed to operate on a seven day per week basis. There are considerable cost advantages related to this size of operation in terms of feed milling, pullet rearing and egg packaging labour.

The other farm model is designed based on progressive farm operations in Canada. It includes a completely automated egg packing system, but does not include the feed mill and the pullet rearing facility. Industry sources in Canada[13] indicate that labour requirements related to this size of operation consist of one full time care taker, and another part time helper.

The purpose of this section is not to compare the technologies related to these sizes of operation. Instead, we would like to find out what are the cost advantages and disadvantages of various regions relative to each other, given different assumptions of technology to be used, and whether these advantages are consistent across both technologies.

Egg productivity is assumed based on information from Hy-line, Variety W36, for both farm models, and it is assumed to be the same no matter what location. We note that the data at the end of section 2.0 indicated that Canadian egg operations have superior hen productivity. If this advantage can be carried over to this type of production, then the cost position for Canadian producers is probably better than what we estimate here.

3.1.2. Feed rations

The total amount of feed used per dozen eggs is determined based on a feed-egg ratio suggested by Hy-line Commercial Management Guide, Variety W-36, 1998-99. It includes two components:

- pullet feed 0.2 kg/dozen eggs
- layer feed 1.44 kg/dozen eggs
- Total 1.64 kg/dozen eggs

The smaller size operation (150 thousand layers) is not assumed to include pullet rearing, so pullet feed is not included in our calculations for this kind of operation.

The following table reports the feed components used in calculating feed costs. Eastern Canada's and US feed rations are considered to be based mainly on corn and soybean meal, while Western Canada's rations are based on a combination of wheat, barley, soybean meal, canola meal, meat meal and animal fats.

[13] From a telephone interview with Penny Kelly, General Manager, Manitoba Egg Producers Marketing Board.

Table 3.1. Region Based Feed Rations for Egg Layers

	Feed Components in Percent		
	Eastern Canada	Western Canada	US
Corn	65 %		65 %
Wheat		54 %	
Barley		12 %	
Soybean meal	25 %	8 %	25 %
Canola Meal		7 %	
Meat Meal		7 %	
Animal Fats		2 %	
Premix Minerals	10 %	10 %	10 %
Total	100 %	100 %	100 %

Source: From telephone interviews with various feed mills.
Note: Corn appears to be used occasionally in Manitoba feed rations, when prices are favourable. However this does not seem to be the general case.

3.1.3. Sources and costs of financing

Sources of financing are assumed to include both equity and debt. The debt-equity ratio is assumed to be 3:1. Calculations are based on a 20 year bank loan at interest rates equal to prime rate plus two percent, and the rate of return on equity is assumed to be prime rate plus ten percent. US and Canadian prime rates used are based on September 1998 information (namely 7.5 percent for Canada and 8.5 percent for the US). No distinction among provinces or states is made in terms of interest rates. Interest rate cost is calculated based on average interest paid during the whole loan term.

3.1.4. Method of Depreciation

All capital investment is assumed to be depreciated using the straight line method, during a period of ten years.

3.2. Feed Costs

In order to be able to eliminate seasonal influences, we used average feed prices for the last three years. For corn, wheat, barley, canola meal, meat meal and fats, we used average prices by crop year (August-July), from August 1995 to July 1998[14]. Soybean meal prices are an exception. Since US soybean meal prices are reported by calendar year, we used average prices by calendar year for both Canada and the US, namely from January 1995 to December 1997. Average

[14] See Table B.1. in Appendix B.

exchange rates for the corresponding periods were used to express all costs in Canadian funds.

The original data on US soybean meal prices were for 44 percent protein meal, while the Canadian prices are reported based on high value meal (48 percent protein). In order to make feed costs comparable, we made the necessary correction on reported US prices and reported all prices based on high value meal prices. The following table gives the calculated feed cost per dozen eggs produced, by state/province and size of operations.

Table 3.2. Feed Costs by Province/State and Size of Operation

	Size of Operation	
	1 Million Layers	150 Thousand Layers
	---------- cents / dozen ----------	
Quebec	34.3	31.5
Ontario	33.6	29.5
Manitoba	31.5	27.7
Saskatchewan	30.2	26.5
Alberta	31.5	27.6
Ohio	33.2	29.1
California	45.3	39.7
Iowa	32	28.1
Indiana	33.1	29.1
Pennsylvania	37.3	32.8

Note that feed costs for the two sizes of operation are not directly comparable, since feed costs in the larger operations include both layer and pullet feed. Indeed, there may be direct savings related to the size of operation, due to greater bargaining power, onsite feed mixing, etc. However, these types of savings do not show up in our study, since we used average prices of separate feed components. The purpose of including two sizes of operation is to see whether the size of operation has any influence on the relative ranking of provinces/states in terms of production costs. Indeed the ranking remains the same for both sizes of operation. The lowest feed cost per dozen is found in western Canada, followed by the Corn Belt states (Ohio, Iowa, Indiana) then eastern Canada, Pennsylvania, and California. Among western provinces, Saskatchewan appears to have the lowest feed cost per dozen eggs. The advantage of western Canada results from the fact that wheat is an important element in feed rations for layers, and feed wheat has been priced competitively to other feedgrains. The importance of wheat in the ration also explains why Saskatchewan has the lowest feed cost since that province has the lowest wheat prices.

3.3. Labour Costs

Labour costs per dozen eggs are calculated based on province/state specific information on average wages for livestock workers in1997. In addition, it is assumed that a manager's salary is two times higher than the average annual income from livestock labour. There is no specific survey information available to confirm this assumption, but it is proportionately similar to the data used in a recent study on the costs of producing hogs (Martin, Kruja and Alexiou). Personnel benefits are also taken into account. Average exchange rates for 1997 are used to represent all costs in Canadian funds.

Again, direct comparisons between different sizes of operation are meaningless given that they represent different technologies and that on-site labour is used for different purposes. However, the following table shows that the ranking of labour costs is preserved despite the technology used. Unlike feed costs, which were mostly determined by regional differences, labour costs are more province/state specific. Saskatchewan represents the lowest labour costs, with 3 cents per dozen in large size operations, followed by Ontario and Manitoba and Quebec. Alberta is the most expensive province in Canada in terms of labour costs. In general, it can be noted that Canadian provinces have lower labour costs per dozen eggs than the US regions.

Table 3.3 Labour Costs by Province/State and Size of Operation

	Size of Operation	
	1 Million Layers	150 Thousand Layers
	---------- cents / dozen ----------	
Quebec	3.3	1.9
Ontario	3.2	1.9
Manitoba	3.3	1.9
Saskatchewan	3	1.8
Alberta	3.8	2.3
Ohio	4.4	2.5
California	4.6	2.6
Iowa	4.2	2.4
Indiana	4.4	2.5
Pennsylvania	3.6	2.1

3.4. Depreciation and Interest Costs

Given the assumed linear depreciation schedules, interest rates and dividend payments, the main factor that differentiates among provinces/states is the cost of construction. From industry sources[15] we found out the following costs for chicken barns in Canada and the US:

[15] Provincial egg boards in Manitoba, Alberta, Ontario.

Table 3.4. Construction Costs in 1998

	C $ / bird
Quebec	25
Ontario	25
Manitoba	22
Saskatchewan	22
Alberta	20
US	18.68

US construction costs were taken from Bell's study, and corrected for inflation (using a US producer price index) to bring them to the 1998 level. Average exchange rates for 1998 were used to express these costs in Canadian funds.

From the table above one can anticipate that the US is estimated to have the lowest depreciation costs per dozen eggs, followed by Alberta, Manitoba and Saskatchewan. The eastern provinces appear to have the highest depreciation costs per dozen eggs.

The gap between interest costs in the US and Canada is narrower than that for depreciation costs. Interest costs are determined by the amount of capital investment, and the interest (dividend) rates. While capital costs are lower in the US, interest rates are higher, and this contributes to a narrowing of the gap between the US and Canada in terms of total interest cost per dozen eggs. However, it is of interest to note that the prime rate gap between the two countries is narrowing. Last year this gap was two percent, while in 1998 US prime rates are only one percent higher.

As shown in the following table, the US is estimated to have the minimum depreciation and interest/dividend costs per dozen eggs.

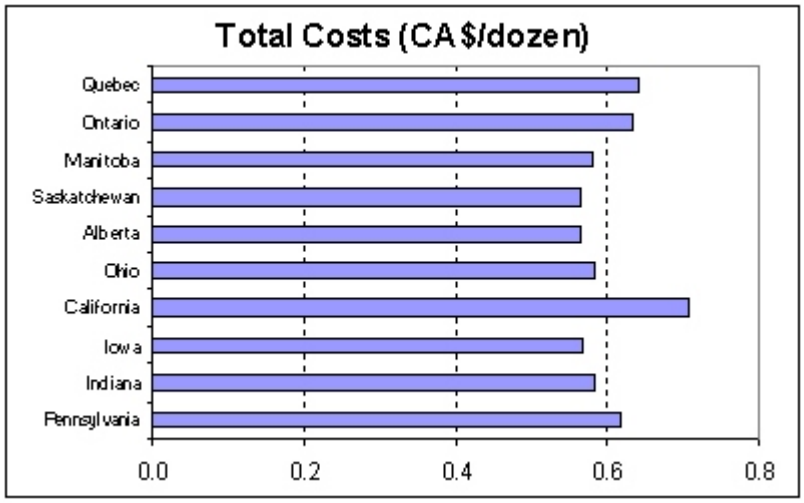
Table 3.5. Depreciation and Interest/Dividend Costs by Province

	Size of Operation	
	1 Million Layers	150 Thousand Layers
	---------- cents / dozen ----------	
Quebec	26.48	20.21
Ontario	26.48	20.21
Manitoba	23.30	17.79
Saskatchewan	23.30	17.79
Alberta	21.19	16.17
US	20.68	15.78

3.5. Total Costs[16]

The cost components calculated above represent the major cost components in egg production. The total for all these components is given in the following figure.

Figure 3.1. Total Costs by Province/State - 1 Million Layers Operation



Alberta represents the lowest cost in egg production (56 cents per dozen). There is a small gap (one cent per dozen) between Alberta and Saskatchewan, while Manitoba appears to have the same costs as Ohio and Indiana (58 cents per dozen). The following table shows that the above ranking is maintained in both sizes of operation.

[16] The term "total costs" used here does not represent total costs of production, but the total of all cost components analysed in our study.

Table 3.6. Total Cost by Size of Operation

	Size of Operation	
	1 Million Layers	150 Thousand Layers
	---------- cents / dozen ----------	
Quebec	64.1	53.6
Ontario	63.3	51.6
Manitoba	58.1	47.4
Saskatchewan	56.5	46.1
Alberta	56.4	46.1
Ohio	58.2	47.4
California	70.6	58.1
Iowa	56.8	46.2
Indiana	58.2	47.3
Pennsylvania	61.6	50.6

4.0. Processor Concentration and Industry Competitiveness[17]

Processor efficiency in Canada is affected by the lack of sufficient egg production for processing and this creates a disadvantage compared to the competing US processors who enjoy the benefits of economies of scale. Canadian processors' efficiency is also influenced by the efficiency of egg producers. To ensure a continuous supply of eggs for processing, it is necessary that processors work with efficient producers. Among other factors, producer efficiency is related to the size of farm operations. Currently the common size of egg operations in Canada is 5,000 to 20,000 layers. An efficient egg operation should ensure complete utilization of on-farm egg processing (packing and/or grading) equipment as well as complete utilization of truck loads for transporting eggs to processors. This appears to equate to a level of 100-150 thousand hens.

4.1. Processor Concentration

Total value of shipments of Canadian egg processing in 1996 was $77.9 million. This corresponds to about 120 thousand boxes of eggs broken each week. There are about 20 egg processing stations in Canada, but 95 percent of eggs are processed by the largest five firms. They are located in Manitoba, Ontario, and British Columbia. The largest egg processor, Inovatech, is located in Manitoba and Ontario and is estimated by people in the industry to

[17] Statistics Canada does not report egg processing under a separate SIC code. Egg processing is reported under "Other Food Industries" and as such it is difficult to obtain specific hard data. Part of the information presented in this section is collected through telephone interviews with industry participants.

account for about 50 percent of total eggs processed in Canada. (Processor information is not available given the high level of concentration). Contrary to what the level of concentration would suggest, egg processors in Canada do not enjoy much market power. The prices they pay to egg producers are determined based on US breaker egg prices and current import tariffs. The following is the formula used to calculate the base price for breaker eggs in Canada:

Base P = (US reference Price - yield conversion + washing cost)* exchange rate + duty

where: US Reference Price	=	Average Urner Barry low-point price from the Central region for breaking stock for a 48-50lbs case
yield conversion	=	2.5%
washing cost	=	1 cent

Producers in Alberta receive the base price, whereas producers in other provinces receive the base price plus a provincial adjustment rate as follows:

BC, ON, QB Price	=	Base P + 3 ¢/doz
MB Product dried	=	Base P
MB Product other	=	Base P + 1 ¢/doz

The current pricing system for processing eggs favours egg processing expansion in Alberta and Manitoba, since egg producers in these provinces receive the lowest prices. In addition, given the estimated cost advantage of the prairies, it is more likely that expanded egg processing facilities in these provinces will ensure a continuous supply from egg farm operations. Currently, Manitoba producers supply 35 percent of national processing eggs.

In the United States, there are about 100 egg processors. Total value of shipments in 1996 was US$ 1.4 billion. In 1997, the processing capacity of the US industry was 53 million cases[18]. This is 19 times more than the Canadian egg processing volume. However, the value of shipments in 1996 was 25 times higher than in Canada, suggesting higher processors' margins.

Michael Foods, Inc. is the major egg processor in the US and breaks about 40 percent of the eggs[19]. Their breaking capacity is about 420,000 cases per week. Twelve other processors (including Estheville Foods, Wabash Valley Produce, Rose Acres Farms, Daybreak Doods, National Egg Products, Echo Lake Farm, Golden Oval Eggs, Sparboe Companies, Henningsen Foods, Inc., Midwest Poultry Services L.P., Oskalossa Food Products, Cal-Maine Foods, Inc.) broke about 47 percent of national broken cases in 1997[20]. The average breaking capacity for these 12 processors was about 80 thousand boxes per week, which is higher than the largest

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[18] 1 case = 30 dozens = 2 boxes

[19] From a telephone interview with one of the company's production managers.

[20] Source: Egg Industry - January 1998

Canadian processor's capacity. It would take only 1.5 of these processors (at average capacity) to break all the industrial eggs for Canada. More than 69 percent of industrial eggs in the US are broken by companies that have larger egg processing capacity than the largest egg breaker in Canada. The following table gives more details about US egg breakers.

Table 3.7. Top Thirteen US Egg Breakers

	Average capacity in 1997	Percent of total US
	000 cases/week	%
Michael Foods, Inc. Minneapolis, MN [(1)]	420	41
Estheville Foods, Estheville, IA	103	10
Wabash Valley Produce, Dubois, IN (includes Brown Produce Co. and Ballas Egg Products Corp.)	79	8
Rose Acres Farms, Soymour, IN	59	6
Daybreak Doods, Lake Mills, WI	44	4
National Egg Products, Social Circle, GA	30	3
Echo Lake Farm, Wankesha, WI	29	3
Golden Oval Eggs, Renville, MN	27	3
Sparboe Companies, Calmar, IA	27	3
Henningsen Foods, Inc., White Plains, NY	22	2
Midwest Poultry Services L.P., Mentone, IN	21	2
Oskalossa Food Products, Oskaloosa, IA	20	2
Cal-Maine Foods, Inc.Jackson, MS	17	2

Source: Egg Industry - January 1998

[(1)] Michael Foods, Inc. chose not to participate in the survey conducted by Egg Industry. Data for Michael Foods in this table are based on a telephone interview with a production manager at this company.

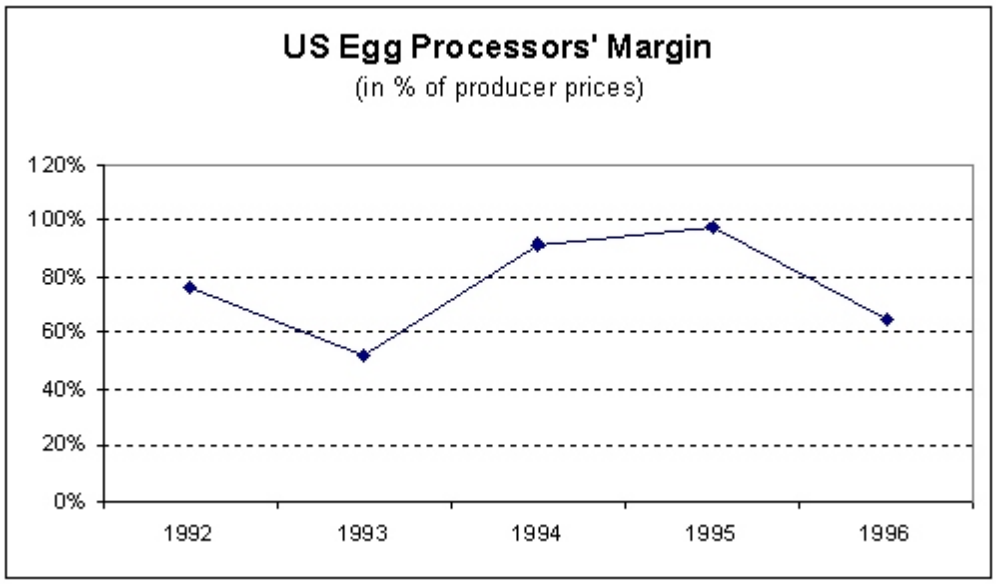
4.2. Processors' Margins in North America

As shown in Figure 4.1, US egg processors enjoy substantial margins. The calculations are based on average value of shipments per dozen of processed eggs and on producer prices for processing eggs. The margin for Canada in 1996 was 27 percent[21]. Producer prices for processing eggs in Canada are determined using a formula with US prices as the base price. So the reason for higher margins in the US could be explained by the level of competition as well as by the presence of high value added products. It is interesting to note that this situation is the opposite when comparing the US and Canadian poultry processing industries. Average Canadian poultry processors' margins were 66 percent of producer prices in 1997, while the US counterparts enjoyed much lower margins (21 percent)[22].

[21] Source: Agriculture and Agri-food Canada

[22] Source: Chicken Farmers of Canada

Figure 4.1. Average Margins of Egg Processors in the US



Source: US Census of Manufacturers
USDA

5.0. Constraints to Expanded Production

There may be limits to the expansion of egg production in Canada. In this section, two issues that may impose constraints are addressed.

5.1. Environmental issues

As with other kinds of livestock, there is increasing public concern about manure disposal. These concerns are partly related to manure smell and the proximity of egg farms to populated locations. Most importantly, there is perceived danger from manure leeching into ground or surface water systems. Increased concentration of egg production in a given region increases the exposure to various diseases for humans and other living species. As a guideline, 7.5 acres are required for manure disposal for every 1,000 layers[23]. This is based on the amount of manure that can be spread on field crop land as organic fertilizer. The following table shows the balance of land use for manure disposal in the Prairies:

Table 5.1. Land use for manure disposal in the Prairies

	Number of layers (thousand)	Land Requirements (acres)	Total field crop land (acres)	%
Manitoba	2293	17197.5	11602830	0.15 %
Alberta	2014	15105	23571721	0.06 %
Saskatchewan	1008	7560	35552225	0.02 %
Total	5315	39862.5	70726775	0.06 %

Source: Census of Agriculture 1996

Manitoba represents the highest percentage of land used for manure handling in the Prairies, but still it is less than one fourth of one percent. If the number of layers in Manitoba was increased six-fold, land used for manure disposal would still be less than one percent of total land in field crops.

The following table gives a broader look at land use for manure disposal, including beef, dairy, broilers, and egg layers. Calculations are based on 1996 Census of agriculture data on livestock numbers by province and on similar land requirement guidelines for other kinds of livestock[24].

[23] Source: Focus Group Meetings organized in Alberta by the George Morris Centre.

[24] Source: Focus Group Meetings organized in Alberta by the George Morris Centre.

Table 5.2. Percent of Field Crop Land Used for Manure Disposal in the Prairies.

	Total Manure Disposal Land	Total field crop land	%
	(acres)	(acres)	
Manitoba	299955	11602830	3%
Saskatchewan	431883	35552225	1%
Alberta	851757	23571721	4%
Total	1583595	70726775	2%

Again, given the current livestock numbers, there is ample room for expansion, in terms of environmental constraints. This implies that the prairies enjoy a competitive advantage compared to other regions. However, the discussion should not be simplified only in terms of total crop land by province. Other restrictions come into play when the cost of manure transportation is considered. When deciding the location of an egg farm, distance of manure transportation should be considered along with distance from feed markets and egg processing/grading stations. Also, proximity to populated areas should be another concern in order to avoid concentrating livestock production around cities.

5.2. Feed supply issues

The following table uses feed rations given in section 3.0 to calculate the total quantity of wheat and barley required to feed the current number of layers in each prairie province.

Table 5.3. Provincial Use of Grains for Egg Production

	Current Use of Grains for egg production (tonnes)		Total production (all wheat) (tonnes)	
	Wheat	Barley	Wheat	Barley
Manitoba	42935	9541	2928300	1680800
Saskatchewan	18874	4194	12395300	4202100
Alberta	37711	8380	6330300	5965600
total	99521	22116	21653900	11848500

As shown in Table B.1. in the appendix, on average, Manitoba producers pay slightly higher prices for feed wheat compared to other prairies provinces. This price difference is higher than provincial basis difference would suggest, and might be explained by differences in provincial feed wheat supply.

Table 5.3 illustrates the fact that while Manitoba uses more wheat for egg production, wheat production in Manitoba is one-fourth of wheat production in Saskatchewan. Indeed only 18 percent of wheat production in Canada is used for animal feed. If we apply this percentage to total Manitoba wheat production, current use of wheat for feed in Manitoba represents eight percent of feed wheat produced in this province. Clearly, there are some natural limits to expanded egg production in Manitoba, given that other livestock compete for feed wheat use.

In addition, feed wheat supply is only seen as a residual of wheat for human consumption. Only low quality wheat goes for feed unless there is high quality wheat that can't be sold for human consumption. As a result, feed wheat supply fluctuates depending on wheat quality and total wheat supply, forcing feed wheat prices to fluctuate widely, based on crop conditions. In this study we used a three year price average to avoid seasonal differences. Recently there was a significant decline in feed grain prices. In order to test the results of our study under the light of the recent price scenario, we used September 1998 off-board prices for feed wheat and feed barley at delivery points in the south central parts of each prairie province. As shown in the following table, Saskatchewan still represents the lowest feed cost per dozen eggs. However, Manitoba and Alberta switch places compared to the average price scenario. In all cases, the differences in costs among the three provinces are very small.

Table 5.4. Production Costs in the Prairies - September 1998 Scenario

	Feed Costs		Total Costs	
	1 Million Layers	150 Thousand Layers	1 Million Layers	150 Thousand Layers
	cents / dozen		cents / dozen	
Manitoba	23.03	20.22	49.6	39.95
Saskatchewan	22.46	19.72	48.76	39.29
Alberta	25.06	22	50.04	40.43

Expanded egg production should be seen as a complex decision, but will, to a large extent require a constant supply of feed wheat. This can be possible if feed wheat varieties are introduced as an alternative to wheat for human consumption. In addition to stability, this could also offer increased feed wheat supply, given the possibility that feed wheat varieties may offer higher yield. From the perspective of grain producers, this alternative would provide a source of diversification, given the relatively stable demand for feed grains.

It is also important to recognize the fact that different kinds of feed grains are used interchangeably in egg layers' rations, depending on the price scenario. This suggests that the answer to the stable feed supply may not rely only on feed wheat varieties, but also on feed varieties of other grains. In other words, there is the need for an integrated feed grain research program, which would examine all aspects of feed grain production.

6.0. Summary and Conclusions

The following section is organized based on the initial objectives of the study.

- To assess the international market potential for eggs.

Evidence shows that demand for eggs is changing recently. Processed eggs are gaining share in total egg consumption, and in addition are contributing to an apparent shift in domestic demand for eggs. The analysis indicates that demand for processed eggs is expanding very rapidly. This is the result of a combination of tendencies: on one hand, there is increased demand for convenience foods, on the other hand, consumers seem to favour the presence of eggs (better than egg replacement products) in the ingredient list of their favourite foods.

International trade in eggs has been relatively flat, with an increasing share going to the Asian countries. Japan will likely remain the main importing market. But import restrictions are declining as the result of trade agreements, and consumption is correlated with incomes. Thus additional markets could emerge in the future.

Given the IMF projections of GDP growth rates a potential turnaround from this year's poor performance can be expected in Japan and Hong Kong. If these forecasts are accurate, it should bode well for North American exports of eggs and egg products to Japan and Hong Kong. However, China is emerging as a competing country for egg exports. The US have already lost part of their Hong Kong market share to China.

Even though the US is the main exporting country, it represents the main export market for Canadian eggs. Canadian production is so small that the market could absorb it with little impact on prices.

- To compare production costs for eggs in Canada to other countries.

Using standard budgets for two egg production operations, production costs were compared for five provinces in Canada and top five egg producing states in the US. This comparison is based on the main components of egg costs, including feed, labour, depreciation and interest costs. The results show that Alberta and Saskatchewan represent the lowest cost for egg production (56 cents per dozen). Iowa follows with only one more cent per dozen. Manitoba, Ohio and Indiana are all in the range of 58 cents per dozen.

When comparing the individual components of production costs, it becomes clear that the main advantage for western provinces relies on feed costs. This advantage may be attributed to the recent removal of the western grain transportation subsidy, and also to the feed rations used in west, which include wheat and barley instead of corn. When comparing feed costs among the prairies, Manitoba appears to have a disadvantage, given the high price of feed wheat. For Alberta, lower construction costs seem to make up for higher labour costs in this province.

Corn Belt states in the US have lower feed costs than eastern Canadian provinces. The main advantage for the US relies on relatively lower construction costs compared to all Canadian provinces. However, this advantage is diminished when considering higher US interest rates.

- To assess the potential effects of the changing structure of Canada's egg processing industry on the relative competitiveness of the egg industry.

The Canadian egg processing industry is limited by the size of operations. Compared to US competitors, Canadian egg processors do not enjoy the benefits of economies of scale. More than 69 percent of industrial eggs in the US are broken by companies that are larger than the largest egg processor in Canada. Evidence shows that Canadian margins at the processing level are much lower than the US margins.

The main limiting factors for expanding egg processing capacity in Canada appears to be the number of industrial eggs produced, as well as the size of egg producing facilities. It is in the interest of egg processors to deal with efficient egg producers. Efficiency of egg producers is closely related to the size of operations, which is dictated by transportation costs and the capacity of on-farm processing equipment.

- To address the potential impacts on Canada's competitiveness of issues such as environment, food safety and feed grain supply

Increased concentration of egg production in a given region increases the exposure to various diseases for humans and other living species. The prairies enjoy a competitive advantage compared to other regions, given the crop land available for manure disposal. However, an increasing concern is the high concentration of livestock production around cities, which implies increased costs related to manure transportation.

Feed grain supply is considered as a constraint for expanded egg production. One of the solutions suggested in this report is to ensure constant supply of feed grains through introducing the idea of growing grains especially for feed use and not consider feed grains as a mere residual of human grain consumption.

Appendix A

Table A.1. Canada's Tariff Commitment Presented at the Uruguay Round of GATT

	Tariff Equivalent (%)		Specific Tariff Rate	
	1995	2000	1995	2000
Birds eggs in shell (not for hatching)	192.3	163.5	but not < 90 ¢/doz	but not < 79.9 ¢/doz
Broken Eggs - dried			720.1 ¢/kg	612.1 ¢/kg
Broken Eggs - other			178.5 ¢/kg	151.7 ¢/kg

Table A.2. US Tariff Commitment Presented at the Uruguay Round of GATT

	Specific Tariff Rate	
	1995	2000
Birds eggs in shell fresh	3.5 ¢/doz	2.8 ¢/doz
Broken eggs - dried	59.6 ¢/kg	47.6 ¢/kg
Broken eggs - liquid or frozen	12.1 ¢/kg	9.7 ¢/kg

Table A.3. Japan's Tariff Commitment Presented at the Uruguay Round of GATT

	Tariff Equivalent (%)		Specific Tariff Rate	
	1995	2000	1995	2000
Birds eggs in shell fresh	20	17		
Egg yolks - dried	25	18.8		
Egg yolks - liquid or frozen	25	20	but not < 60 yen/kg	but not < 48 yen/kg
Egg whites and whole - dried	25	21.3		
Egg whites and whole - liquid or frozen	25	21.3	but not < 60 yen/kg	but not < 51 yen/kg

Table A.4. EU's Tariff Commitment Presented at the Uruguay Round of GATT

	Specific Tariff Rate	
	1995	2000
Birds eggs in shell fresh	475 ECU/T	304 ECU/T
Egg yolks - dried	2223 ECU/T	1423 ECU/T
Egg yolks - liquid	969 ECU/T	620 ECU/T
Egg yolks - frozen	1036 ECU/T	663 ECU/T
Egg whites and whole - dried	2147 ECU/T	1374 ECU/T
Egg whites and whole - liquid or frozen	551 ECU/T	353 ECU/T

Table A.5. China's Tariff Commitment Presented at the Uruguay Round of GATT

	Tariff Equivalent (%)	
	1995	2004
Birds eggs in shell fresh	60	40
Broken eggs	70	40

Appendix B

Table B.1. Feed Prices used in Calculations (average 1995-98)

	Quebec	Ontario	Manitoba	Saskatchewan	Alberta
Wheat (CA$/tonne)			176.35	161.26	168.12
Barley (CA$/tonne)			141.81	130.84	146.76
Corn (CA$/tonne)	191.01	176.99			
Soybean meal (CA$/tonne)	377.37	359.88	351.23	360.25	372.83
Canola meal (CA$/tonne)			222.23	222.67	231.77
Meat Meal			352.04	351.57	356.78
Animal Fat			575.99	623.84	623.79
Premix Minerals					

	Ohio	California	Iowa	Indiana	Pennsylvania
Corn (US $ / bu)	3.05	3.57	2.84	3.03	3.47
Soybean meal (US $ / Cwt)	15.12	23.98	15.12	15.12	16.78

Sources: Agriculture and Agrifood Canada,
USDA Economics and Statistics System

Note: Soybean meal prices are in averages for calendar years (1995-97)