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The Losses in the Beef Sector in Canada From BSE

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Danny Le Roy
Assistant Professor
Department of Economics
The University of Lethbridge

K. K. Klein
Professor
Department of Economics
The University of Lethbridge

Tatiana Klvacek
Research Assistant
Department of Economics
The University of Lethbridge

<http://www.catrade.org>

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1. Introduction

Before May 20, 2003 cattle and beef production activities had been expanding, especially in Alberta, because of changes in government policies and from growing demand among foreign consumers. According to Le Roy and Klein (2005) the catalysts stemmed from problems in the Western grains sector and policies that were implemented to remedy them. In Alberta, the provincial government developed major new programs during the 1980s to stimulate large scale expansion of cattle production and processing activities.¹ Changes in federal policies regarding international trade provided additional stimulation. Following the implementation of the CUSTA, beef produced in Canada became exempt from import quotas in the United States. In turn, beef exporters in the United States gained largely unhampered access to the Canadian market. Tariffs on live cattle were eliminated. However, barriers were maintained and enforced by federal governments in Canada and the United States against beef imports from outside the CUSTA region.² Shielded from the full effect of competitive pressure, domestic producers focused on trying to satisfy North American consumers and those in high price regions like Japan and South Korea.

These policy changes had the desired effects. In Alberta between 1986 and 2001, the number of yearling steers increased from 426,000 to 960,000, the number of beef heifers for market increased from 225,000 to 720,000, and the total number of cattle and calves on farms increased from 3,746,000 to 6,500,000 (Statistics Canada, 2001 Census of Agriculture). While cattle and beef production was aimed primarily to satisfy domestic demands during the 1980s, by 2003 about half of what was produced in Canada was intended for foreign customers. Almost all live cattle exports were destined for the United States. Seventy per cent of meat exports went to the United States with the remainder sent to consumers in Mexico, Japan, South Korea and other countries. When BSE was discovered in Alberta on May 20, 2003, these export markets were partially or completely shut. This has led to unprecedented production and marketing disruptions throughout the Canadian beef sector.

It had been widely and repeatedly reported in television and print media that the beef sector in Canada was losing an estimated \$11 million a day because of trade bans and the resulting collapse in domestic prices (Dorosh, 2003, pg 1; St. Germain, 2003, pg 1994). A study commissioned by the Canadian Animal Health Coalition in June 2003 estimated the total economic impact of a four month trade ban on beef exports resulted in a cost to the sector of \$2.5 billion (Serecon, 2003a). Later that year, Serecon Management Consulting released a subsequent report indicating that if foreign governments kept current import prohibitions in place, the direct costs to the livestock industry would be \$3.3 billion and that losses outside the industry would total an

¹ There were three initiatives. Since subsidized freight rates for prairie grains increased the on-farm prices of grain, the Alberta government instituted a subsidy to offset its detrimental impacts on the growth of the cattle industry. A second initiative entailed subsidizing the expansion of cattle slaughter capacity in Alberta. Finally, to help diversify export destinations for beef, a third initiative involved developing and funding a beef export promotion agency.

² In 1994, the preferential trade system was extended to the government of Mexico under the NAFTA.

additional \$1.8 billion (Serecon, 2003b). According to the chief economist of the Bank of Montreal, between May 2003 and November 2004, farm cash receipts for cattle plunged by \$5 billion from what they otherwise would have been if BSE had not been discovered (O'Neill, 2004, pg 4). According to O'Neill (2004), cash receipts for cattle through the first six months of 2004 were close to 30 percent lower than the average for the five years ending in 2002. On June 25, 2005, the Canadian Broadcasting Corporation reported that "over the past two years, Canada's beef industry has claimed BSE-related losses of more than \$7 billion – most of it due to the U.S. ban on live Canadian cattle imports."³

These reported losses assumed that cattle and beef exports prior to May 20, 2003 had no market after May 20, 2003. Losses from BSE in Canada generally were calculated by multiplying the daily or monthly pre-BSE returns from exports of live cattle, beef and by-products by the number of days or months that foreign markets remained closed. This method of estimating losses does not accurately reflect the economic consequences from losing access to export markets. Cattle, beef and by-products that had been exported prior to the discovery of BSE instead were marketed domestically after May 20, 2003. Returns generated by these products often were significantly lower than before May 20, 2003, but they were not zero. Reported losses to the beef sector, therefore, were overstated.

The losses to the domestic beef sector from the discovery of BSE in Canada were the product of two separate types of market intervention.⁴ The first relate to increased costs from complying with regulations enforced by Canadian Food Inspection Agency for handling, slaughtering and exporting cattle and beef. These losses were compounded because potential foreign consumers were prohibited from importing Canadian origin cattle, beef and by-products. The consequence of the second type of market intervention was injury to all parties concerned: to the foreign consumers, who lost because they could no longer purchase imported products they wanted; and to producers in Canada, who were prevented from earning higher returns in foreign markets and who therefore had to settle for lower earnings in the domestic market.

1.1. Purpose and Objectives

The consequences of the BSE discovery in Canada hurt all aspects of the domestic beef sector. The situation also presented a dramatic and perplexing problem for policy makers. The adjustment and dislocation in the beef sector was both unanticipated and incomparable in terms of its speed and its devastating impact. Appeals for government assistance were immediate. While it is well known that marketplace interventionism was the source of the disturbances in the Canadian beef sector, an objective, coherent conceptual and empirical analysis was lacking. Providing

³ This article can be found at (<http://www.cbc.ca/story/world/national/2005/06/25/canadaonmadcow-050625.html>). This website has links to many other news articles related to BSE in Canada.

⁴ Murray N. Rothbard provides an insightful typology of market intervention in *Power and Market* (1970). This book is available online at <http://www.mises.org/rothbard/mes.asp>.

such an analysis is the aim of this paper. While the impact of the border closures also affected exports of other ruminants (sheep, goats, deer, elk, moose, bison, etc.) and products derived from these ruminants, the focus of the paper is on cattle and beef. This includes beef cattle and calves, culled dairy cattle and calves, purebred and breeding cattle, beef and beef by-products. The specific objectives are:

1. To provide a brief summary of the history of BSE in Canada.
2. To develop a conceptual framework for estimating the losses to the beef sector in Canada resulting from foreign governments' prohibition of imports of Canadian origin cattle, beef and by-products.
3. To assess the losses to the beef sector from BSE by identifying and estimating the reduced revenues and increased costs.

1.2. Organization

This paper is organized in five sections. The next section provides an overview of BSE in Canada. This includes a description of the nature of the disease, of regulations regarding reporting the disease, of discoveries of BSE in Canada, and an explanation of why the BSE discovery on May 20, 2003 was so problematic. The third section describes the conceptual framework that is used in the fourth section to estimate the losses to the beef sector from May 2003 to May 2005. Finally, the last section offers some concluding remarks.

2. BSE in Canada

2.1. The Nature of the Disease

Bovine Spongiform Encephalopathy (BSE) is one of a number of diseases known generally as transmissible spongiform encephalopathies (TSEs). TSEs are characterized by lesions in the brain and spinal cord characterized by sponge-like changes visible with an ordinary microscope (World Health Organization, 2002). Examples in animals include scrapie in sheep and goats, chronic wasting disease in mink and North American mule deer and elk, and BSE in cattle. BSE has an incubation period of approximately one to eight years with a mean of four to five years (Collee, 1993) and is fatal within weeks of its onset. Strong evidence suggests the agent is composed largely, if not entirely, of a self-replicating protein, called a *prion* (Centre for Disease Control and Prevention, 2005). Speculation as to the cause of the appearance of the disease has ranged from spontaneous occurrence in cattle, the carcasses of which then entered the cattle food chain, to entry into the cattle food chain from the carcasses of sheep infected with scrapie (World Health Organization, 2002).

Creutzfeldt-Jakob disease (CJD) is the most well known TSE in humans. CJD is a rare type of dementia that affects about one in every one million people each year

(NINDS, 2005). Humans who develop CJD lose the ability to think and move properly, suffer from memory loss and progressive brain damage until they can no longer see, speak or feed themselves. About 90 percent of patients die within a year (NINDS, 2005).

Other human TSEs include Variant CJD, kuru, fatal familial insomnia, and Gerstmann-Straussler-Scheinker disease. Variant CJD (vCJD) is similar to CJD but has three notable differences. First, younger people generally are affected, with an average age at death under 30 years. Second, individuals with vCJD have a longer duration of illness from onset of symptoms to death. The median survival is 14 months in vCJD compared to four months in CJD (Johnson, 2001). Finally, the route of transmission of vCJD is not yet fully proven although it is generally believed that it is transmitted through exposure to food contaminated by BSE. Other human TSEs have not been linked to food exposure, but the perceived risks are now a major economic and political issue.

From the early 1980s to 2004 there have been over 184,145 cases of BSE reported in England (OIE, 2004). From a population of 60 million, a high percentage of whom ate infected beef for several years, there have been 101 confirmed deaths from vCJD from 1995 to 2004, plus 36 probable deaths (Brown, 2004). To give perspective to this number, over the same period there were nearly 500,000 reported cases in the United Kingdom of salmonella poisoning, including 119 deaths in 2000 alone (Brown, 2004). In the United States there are 120-130 deaths per year and between 6,000 and 12,000 illnesses per year from meat and poultry *E.Coli* contamination (Brown, 2004).

2.2. BSE Reporting

Reportable animal diseases, like BSE, are diseases that could have important and extensive human health implications. Local, regional, and national authorities require that such diseases be reported when they are diagnosed by veterinarians or laboratories. The purpose of mandatory reporting is to prevent the entry, establishment and spread of disease.

Since BSE is transmissible across geo-political boundaries, the disease is a central focus of the World Organization for Animal Health (known formally as the Office International des Épidémiologies (OIE)).⁵ The fivefold purpose of the OIE is to: [1] ensure transparency in animal disease detection and reporting; [2] collect, analyze and disseminate veterinary scientific information; [3] provide expertise and encourage international solidarity in the control of animal diseases; [4] improve the legal framework and resources of national veterinary services; and [5] to safeguard world trade by publishing health standards for international trade in animals and animal products.

⁵ The OIE is an inter-governmental organization originally created by the national governments of 28 countries upon the signing of the International Agreement on January 24, 1924. The number of signatory countries now totals 167.

The OIE has developed standards and guidelines regarding appropriate government responses to a BSE discovery.⁶ The Terrestrial Animal Health Code contains standards, guidelines and recommendations to be used by national veterinary authorities. The aim is to prevent the introduction of infectious agents pathogenic for animals and humans by way of imported animals and animal products, while avoiding unjustified trade barriers. The OIE Terrestrial Animal Health Code classified countries into one of five BSE risk categories (BSE free, BSE provisionally free, country of minimal risk, country of moderate risk, and country of high risk). The OIE did not and does not assign countries to particular risk categories. While OIE standards are recognized as reference international sanitary rules by the World Trade Organization, its Terrestrial Animal Health Code is non-binding.

On the basis of criteria defined in the International Animal Health Code, the Scientific Steering Committee of the European Union recently carried out a geographical BSE risk assessment in a number of countries (Heim, 2005). Table 1 reveals the global incidence of BSE and the EU ranking BSE risk in each country. As of August 2004, BSE had been confirmed in 24 countries. Risk rankings are highest where the incidence of the disease is highest, notably in England and in Portugal.

Since the Terrestrial Animal Health Code is not binding, governments in importing countries are free to make their own judgment on the BSE status of an exporting region. The large trade disruptions from reporting and confirming a case of BSE did not come from a region losing its BSE free status. Instead, national governments completely prohibited beef and cattle trade imports without consulting the recommendations in the Code or conducting a risk analysis in accordance with their OIE and WTO obligations. Trade was prohibited even for the slightest BSE risk. The federal government in Canada for example, prohibited all beef and cattle imports from the United Kingdom, other European countries and Japan when BSE was discovered there.

Rather than a total import prohibition, the Code prescribed increasingly restrictive recommendations commensurate with the level of BSE risk in each country. The OIE became concerned about large international trade disruptions that were a product of governments misinterpreting its Terrestrial Animal Health Code. As a result, the OIE set new guidelines with respect to beef exports and the risk of BSE in May 2005. While the old guidelines focused on the number of cases in a country, the new guidelines consider the relative risk for BSE that reflects the steps a country has taken to manage and reduce BSE in the food chain. In addition, the boneless beef was added to the list of non-risk products, allowing it to be traded regardless of a country's BSE status.

The new guidelines involve a three-tier system of risk classification. This replaces the five categories previously used. The new classifications are: [1] negligible BSE risk; [2] controlled BSE risk; [3] undetermined BSE risk. Among other criteria, the first category describes countries with an approved surveillance regime that have no

⁶ BSE is designated as a class B disease which means that it has socioeconomic and/or public health importance and it is significant in the trade of animals and animal products across national boundaries.

Table 1: Global Incidence of BSE, 1996-2005

Country/Year	1996 and Before	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	EU Risk Rank
Austria	0	0	0	0	0	1	0	0	0	1	2	III
Belgium	0	1	6	3	9	46	38	15	11	2	131	II
Canada	1	0	0	0	0	0	0	2	1	1	5	II
Czech Republic	0	0	0	0	0	2	2	4	7	8	23	II
Denmark	1	0	0	0	1	6	3	2	1	0	14	II
Finland	0	0	0	0	0	1	0	0	0	0	1	III
France	25	6	18	31	161	274	239	137	54	18	963	II
Germany	4	2	0	0	7	125	106	54	65	0	363	II
Greece	0	0	0	0	0	1	0	0	0	0	1	III
Ireland	188	80	83	91	149	246	333	183	126	69	1,548	II
Israel	0	0	0	0	0	0	1	0	0	0	1	III
Italy	2	0	0	0	0	48	38	29	7	7	131	II
Japan	0	0	0	0	0	3	2	4	5	7	21	III
Liechtenstein	0	0	2	0	0	0	0	0	0	0	2	II
Luxembourg	0	1	0	0	0	0	1	0	0	1	3	II
Netherlands	0	2	2	2	2	20	24	19	6	0	77	II
Poland	0	0	0	0	0	0	4	5	11	18	38	II
Portugal	64	30	127	159	149	110	86	133	92	37	987	IV
Slovakia	0	0	0	0	0	5	6	2	7	0	20	III
Slovenia	0	0	0	0	0	1	1	1	2	1	6	III
Spain	0	0	0	0	2	82	127	167	137	75	590	III
Switzerland	231	38	14	50	33	42	24	21	3	3	459	III
UK	169,473	4,393	3,235	2,301	1,443	1,202	1,144	611	343	225	184,370	IV
USA	0	0	0	0	0	0	0	0	0	1	1	II
TOTAL	169,989	4,553	3,487	2,637	1,956	2,215	2,179	1,389	878	474	189,757	

Source: OIE. 2005. http://www.oie.int/eng/info/en_esbmonde.htm

I - Highly unlikely to present a BSE risk; II - Unlikely, but a BSE risk cannot be excluded; III - Likely to present a BSE risk, even if not confirmed, or presenting a low level of confirmed BSE risk; IV - BSE risk confirmed at a high level

history of BSE for at least seven years. The second category identifies those countries where a surveillance system is in place but among a number of caveats “it cannot be demonstrated that controls over feeding and meat-and-bone meal...derived from ruminants to ruminants have been in place for 8 years.”⁷ Regions that do not meet the requirements of either the first two categories are classified in the third category.

The new guidelines represent an important improvement. The old guidelines not only produced trade disruptions that were unnecessary to protect human and animal health, but also created a perverse incentive by penalizing producers in regions with well structured, transparent and effective surveillance systems. Moreover, since earlier bans were not based on a risk analysis, it was unclear what steps were necessary for imports to resume.

2.3. Incidence of BSE in Canada

As of August 2006, nine cases of BSE have been discovered in cattle that had been on farms in Canada. The first, discovered on a farm near Red Deer, Alberta on December 8, 1993, was a purebred beef cow that had been imported from the United Kingdom in 1987. That animal and its herd mates were subsequently destroyed along with all offspring and all remaining animals imported from the United Kingdom since 1982. While cattle imports to Canada from the United Kingdom had been banned since 1990, the Canadian government implemented more stringent disease detection and control measures on farms and at slaughter plants. Due to the quick and deliberate actions taken in Canada, exports of beef and live cattle from Canada were not affected. In 1997, the Canadian and U.S. governments introduced ruminant-to-ruminant feed bans in response to the high profile BSE crisis in the United Kingdom. The federal governments of Canada and the United States continued their policy of prohibiting imports of ruminants and ruminant products from countries with a reported case of BSE.

On May 20, 2003, BSE was confirmed in an Angus cow from a herd in Wanham, Alberta. Unlike the earlier case, the infected animal was born, fed and raised in Canada. Governments of 34 countries, including the United States and Mexico, banned imports of ruminant and ruminant products originating from Canada. Slaughter plants in Canada stopped accepting new cattle. The Canadian government stopped all beef shipments not already in transit. Some recently exported live animals already in the United States were returned to Canada. The resulting dislocation in the cattle industry in Canada was unprecedented, and could have been much worse if the United States Department of Agriculture had not readmitted imports of boneless beef muscle cuts and veal from Canada in September 2003.

The third case of BSE in North America was found in a Holstein cow in Yakima, Washington on December 25, 2003. The discovery unleashed additional economic havoc on the North American cattle market. Within hours of the United States Department of Agriculture (USDA) confirmation of this discovery, governments of more

⁷ Complete details can be found in the 2005 OIE Terrestrial Animal Health Code which is available at: http://www.oie.int/eng/normes/mcode/en_sommaire.htm

than 50 nations, including Canada, Mexico, Japan, South Korea, Chile, Mexico and Taiwan, banned beef imports from suppliers in the United States. Like in Canada, border closures led to a collapse of the beef export business, a reduction of trade between backgrounders and feedlots, a decrease in the market value of slaughtered animals, and devastated export-oriented meat processing plants. In Canada, cattlemen relived a horrible nightmare they thought was almost behind them.

Initially it appeared the BSE status of Canada and the United States would be identical. Later it was determined the cow in Washington was actually born in Alberta. The situation for the Canadian beef industry got even worse because opponents of cattle and beef trade used the cow's Canadian connection as a tool to slow and frustrate the normalization of live cattle trade across the Canada-United States border.

To the relief of cattle producers in Canada, on December 29, 2004 the USDA announced that it would re-open its borders to live cattle under 30 months of age as of March 7, 2005. The ensuing enthusiasm in Canada did not last long. About one week later, on January 2, 2005 a fourth case of BSE was confirmed in an eight-year-old Holstein cow from a farm in Barrhead, Alberta. Then, just over a week later, on January 11, 2005, a fifth case was confirmed in a seven-year-old Charolais cow from a herd in Innisfail, Alberta.

While material from the two cases in January 2005 did not enter the food or feed systems, they raised concerns in the United States about lifting the import ban on live Canadian cattle. On March 2, 2005, a federal judge in Billings, Montana, granted a preliminary injunction against USDA regulations that would have allowed imports of live Canadian slaughter and feeder cattle less than 30 months of age. The next day, the United States Senate voted 52-46 in favour of keeping the border closed to Canadian cattle. However, the 9th Circuit Court of Appeals in Seattle overturned the temporary injunction barring live cattle less than 30 months of age imported from Canada on July 14, 2005. Four days later, the first truckload of live cattle since May 21, 2003 crossed the border at Lewiston, New York headed for a slaughterhouse in Pennsylvania. A hearing scheduled for July 27, 2005 on a permanent injunction against the USDA regulations that would have re-imposed the ban on live cattle and also blocked beef shipments, was deferred indefinitely.

To date, five more cases have been confirmed. On January 22, 2006 a sixth case of BSE was found in a six-year-old cow that was born and raised on an Alberta farm. On April 16, 2006 BSE was confirmed in a 71 month old Holstein cow on a dairy farm in the Fraser Valley area of British Columbia. Then on July 3, 2006, a diseased 16 or 17 year old Charolais cross bred cow in Manitoba was found to have BSE. The previous cases of BSE found in Canada were characterized as being similar to the majority of the BSE cases found around the world. However, the case in Manitoba was a less prevalent strain of BSE which has also been reported in Europe and in the U.S. Ten days later, the CFIA confirmed BSE in a 50 month old dairy cow from Alberta. The most recent case was discovered on August 23, 2006 in a mature beef cow from Alberta. No part of these animals entered the human food chain or animal feed

systems. Based on the guidelines and certification recommendations of the OIE, these findings have not affected access to export markets for live cattle under 30 months and beef from these animals. However, the additional cases of BSE have likely delayed the opening of the United States border to cattle over 30 months and beef from these older animals.

2.4. The Problematic Situation

During the early 1990s, the beef industry in Canada became an important part of the agri-food economy and the second largest (after wheat) earner of foreign exchange in the agricultural sector. In 2002, farm cash receipts from cattle and calves totaled nearly \$8 billion, 21% of the total \$36 billion in farm cash receipts in Canada (Statistics Canada, 2001 Census of Agriculture).

According to Statistics Canada, as of January 1, 2003, there were 13.8 million head of cattle and calves in Canada. Seventy two percent of fed cattle were located in Alberta, 17 percent in Ontario with the remainder located in the other eight provinces. In Alberta between 1986 and 2001, the number of yearling steers increased from 426,000 to 960,000, the number of beef heifers for market increased from 225,000 to 720,000, and the total number of cattle and calves on farms increased from 3,746,000 to 6,500,000 (Statistics Canada, 2001 Census of Agriculture).

Table 2 reveals that in 2002, exports of live cattle generated about \$1.8 billion to in revenues and that beef and by-products exports added an additional \$2.2 billion. That year, Canada was the third largest beef exporter in the world⁸. Table 3 shows 76 per cent of beef exports went to the United States.

Expansionary policies in Canada affected the pattern of production and trade of cattle and beef. Net exports of live cattle which were relatively small and occasionally negative prior to 1987 increased to 1.5 million head by 2002. Figure 1 illustrates that net exports of dressed beef, again of a minor magnitude before 1995, had grown to about 350,000 tonnes by 2002. By 2002, beef export earnings totaled about C\$4 billion compared to C\$1 billion in beef imports (Canfax, 2003).

As a large and growing portion of beef production in Alberta was exported, producers became increasingly dependent on access to foreign markets. Though beef can be frozen and stored for some time before deterioration in quality takes place, supply chain disruptions are expensive. Moreover, with increased integration of the North American beef market, slaughter capacity in Canada became inadequate to handle all the animals produced in the country. This was particularly critical for older breeding stock that is regularly culled as new replacements enter the herd. A large proportion of culls in Canada, particularly dairy cows, were exported for slaughter in plants located in the United States.

⁸ In 2001, Australia accounted for 23% of world beef exports, the United States 16%, Canada 15% and Brazil 11%.

Table 2: Canadian Live Cattle Exports to the United States

		Quantity (# of head)			Value (millions \$)		
		2000	2001	2002	2000	2001	2002
Slaughter	Steers	358,961	424,335	346,237	\$464.60	\$621.86	\$478.92
	Heifers	195,182	285,805	248,399	\$244.40	\$393.54	\$329.33
	Cows	171,488	257,584	372,294	\$138.00	\$230.59	\$299.01
	Bulls	44,286	53,575	57,448	\$59.50	\$79.45	\$77.83
Feeder		115,524	190,538	574,992	\$110.60	\$186.37	\$487.56
Other		78,864	94,318	87,082	\$110.10	\$143.41	\$149.31
Total Cattle Exports		964,265	1,306,155	1,686,452	\$1,127.20	\$1,655.20	\$1,821.96

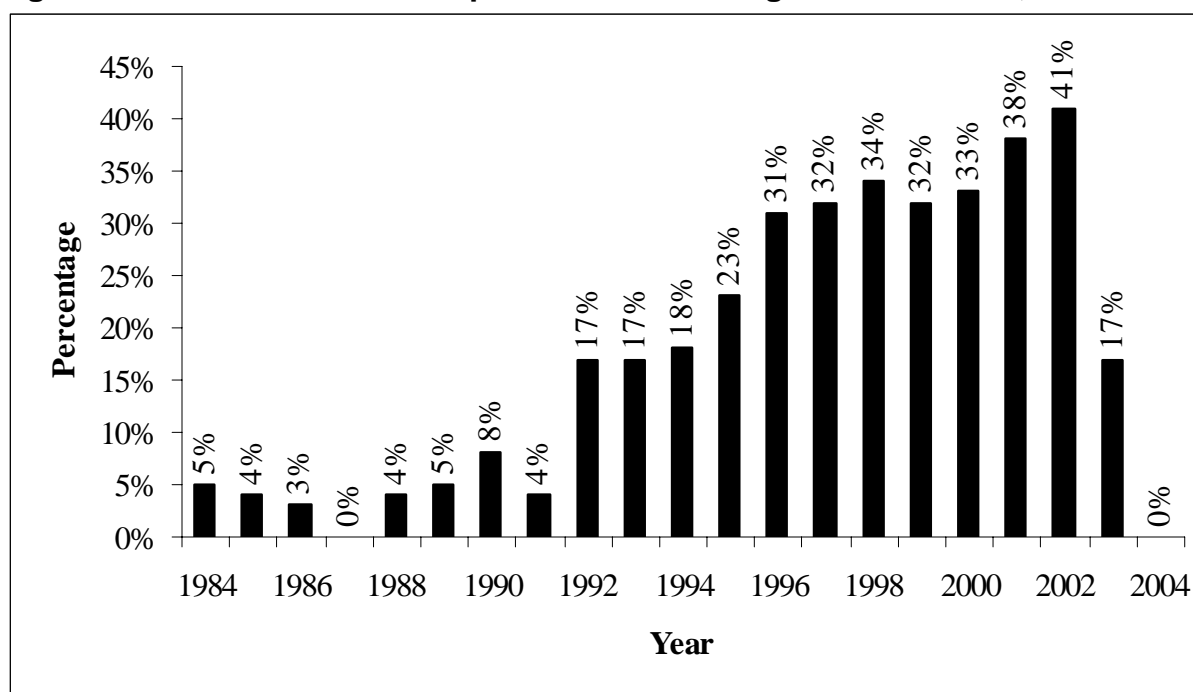
Source: Canfax, 2003.

Table 3: Canadian Beef and Beef Product Exports

	Quantity (tonnes)			Value (millions \$)		
	2000	2001	2002	2000	2001	2002
Destination						
U.S.A	318,464	355,942	373,432	\$1,382.21	\$1,688.70	\$1673.22
Mexico	53,189	69,674	75,809	\$180.25	\$271.69	\$282.52
Japan	28,390	29,245	23,982	\$162.02	\$171.37	\$95.84
S. Korea	20,593	9,420	17,254	\$98.56	\$28.64	\$59.51
Taiwan	2,655	2,991	4,026	\$16.07	\$15.62	\$20.97
Hong Kong	2,112	1,664	570	\$8.97	\$7.22	\$2.78
China	1,203	1,405	2,494	\$3.14	\$4.11	\$6.69
SE Asia	1,434	754	2,204	\$1.56	\$1.34	\$2.48
Central & South America	7,099	7,524	7,526	\$7.06	\$9.03	\$7.55
Caribbean	3,607	5,519	3,398	\$5.55	\$11.41	\$6.76
EU	422	220	67	\$2.00	\$0.78	\$0.23
Russia	2,623	2,437	4,638	\$2.43	\$2.97	\$4.32
Other	4,125	2,934	4,742	\$6.43	\$13.75	\$17.79
Total Beef Exports	445,916	489,729	520,142	\$1,876.07	\$2,226.61	\$2,180.65

Source: Canfax, 2003.

Figure 1: Net Beef and Veal Exports as a Percentage of Production, 1984-2004



Source: Agriculture and Agri-Food Canada.

The border closures after May 20, 2003 created a problematic situation for the export dependent beef and cattle sector. Because foreign consumers were denied access to beef and cattle produced in Canada, lines of production geared towards satisfying these foreign consumers became uneconomic. Cull animals were almost unmarketable as all major Canadian slaughter plants were overwhelmed with deliveries of more profitable high grade, younger animals for slaughter.

Within the beef sector, the loss of export markets increased the supply available for the domestic market and depressed the domestic price for fed cattle, feeder cattle calves and cull cows. Hoping for a quick resolution to the border closures, producers held on to livestock rather than sell at depressed prices. As animals accumulated in the supply chain, feeding losses increased and slaughtering activities ground to a halt. After September 10, 2003 packers were able to sell boxed beef from cattle less than thirty months of age into high priced markets in the United States and Mexico. The economic circumstances enabled packers in Canada to purchase fed cattle at lower prices than would otherwise have been the case. Because of the profitability of this enterprise, slaughtering activities in Canada rebounded dramatically. The number of fed cattle slaughtered in Canada expanded 24% from September 2003, to December 2004 (Canfax, 2004) and continued apace through 2005. Unfortunately, the ability to ship mature purebred, cull or breeding cattle to conventional export markets remained closed.

3. Method

The method to analyze the losses in the beef sector from BSE in Canada involves comparing price and quantity data prior to BSE to data from May 2003 to May 2005. Using historical data, losses to the beef sector are calculated as the reduction in value of exports of beef and live animals, plus the reduction in exports of beef by-products, plus the cost of extra processing required to implement new procedures, less any drop in imports of cattle, beef and by-product (as this broadens the scope for domestic marketing of domestic production).

The year 2002 was chosen as the reference period after considering two other alternatives: [1] projecting cattle and beef production and trade for May 2003 - May 2005 using trend increases in these statistics prior to May 20, 2003, or [2] using five year averages of production and trade (i.e., 1998 to 2002). The former method involves considerable speculation and conjecture, but would have yielded larger estimates for BSE losses than the 2002 reference period. In contrast, the five year average would have generated smaller BSE losses than the 2002 reference period, but fail to capture the extent to which the industry had been expanding, particularly in Western Canada. In view of the shortcomings of the available alternatives and of the intermediate results likely to be generated by it, 2002 was chosen as the base reference period.

Historical price and quantity data from May 2003 to May 2005 reflect all the prevailing trends and changes in policy and in supply and demand conditions, not only in cattle and beef markets, but in all markets, everywhere. And this is appropriate for the purpose of this paper because it permits a valid comparison of economic conditions that existed in 2002 with economic conditions that transpired later.

An analysis of historical price and quantity data offer a practical way to show and interpret the nature of losses to the beef sector. Conceptually, it is possible to identify and trace the economic implications of a change in demand, supply or policy using a quantitative simulation model (Le Roy, Weerahewa and Meilke; Rude and Carlberg). However, the analysis in this paper takes a more straightforward and transparent approach to provide estimates of the economic costs resulting from the border closures including its temporal, spatial and multi-market (both vertical and horizontal) dimensions. Government programs were introduced sporadically over 24 months, and over this time period supply and demand conditions in beef, cattle and other markets changed in innumerable ways.

Import bans not only affected the redistribution of earnings along the beef supply chain, but they also extended into other markets beyond the beef sector. Quantifying the distribution of gains and losses both within and outside the beef sector is inherently difficult, so no attempt to do so is made. In no way does this imply that redistributive effects are insignificant. Higher processing costs ultimately are borne by owners of primary factors of production through lower returns to land and labour on cow-calf enterprises. The BSE crisis also had a negative effect on industries such as livestock trucking, cattle input supply and many others. Offsetting these losses were gains

elsewhere, principally in hogs and pork. Exports from Canada increased to more than 40,000 head per week, compared to a normal 20,000 to 25,000 (Agriculture and Agri-food Canada). In 2003, live-hog exports from Canada to the United States in 2003 reached a record 7.3 million head, up a third from the previous year (Agriculture and Agri-food Canada). Thus losses were partially offset by gains somewhere else within the beef sector and beyond it.

The effects of a second important redistribution which are beyond the purview of this study involve the administration and delivery of taxpayer transfers in the form of BSE disaster assistance. Border closures led to a collapse of the beef export business, a reduction of trade between cow-calf producers, backgrounders and feedlots, a decrease in the market value of slaughtered animals, and devastated export-orientated meat processing plants. Federal and provincial governments in Canada began compensating cattle owners and processors soon after May 20, 2003. Beneficiaries later included both producers and processors of other ruminants. These were not costless undertakings.

Government assistance programs were aimed at short-term solutions as policy makers and industry representatives believed the live cattle import ban in the United States would be lifted shortly after the border was closed on May 20, 2003. This meant that assistance programs were implemented swiftly and in an *ad hoc* fashion as cattle producers and other industry stakeholders pushed for governments to transfer money quickly. Transfers continued through federal, provincial, and federal-provincial programs until the border was partially reopened to live cattle.

On June 18, 2003 (less than one month after the announcement that a BSE cow had been found) the federal and provincial governments announced a \$460 million Federal-Provincial BSE Recovery Program. The assistance package was cost-shared by the federal government and participating provinces and territories on a 60-40 basis (\$276 million from the federal government and a maximum of \$184 million from the provincial and territorial governments). Total funds available were to include \$420 million for producers whose cattle are slaughtered to fulfill domestic demand, and for other ruminants; \$30 million to reduce the inventory of products with limited domestic market; \$10 million for administration. Under the Canada-Alberta program, the provincial government transferred \$100 million. Producers in Alberta who sold fed cattle for slaughter were entitled to compensation on a sliding scale equal to the difference between a base price and an average weekly market price. The measures were to be in place until the United States border was reopened to beef products, or until the approximately 900,000 cattle on feed as of May 20th had been slaughtered (except for cull cows, veal and other ruminants for which the program will operate until no later than August 31st), or until funds for the program were exhausted.⁹ The national-provincial

⁹ Details of this program in Alberta are provided in a government news release titled *Alberta Commits To National Disaster BSE Relief Program*. (<http://www.gov.ab.ca/acn/200306/14642.html>).

program was extended in August 2003, bringing total program funding to \$520 million (Saskatchewan Agriculture, Food and Rural Revitalization, 2003).

In November 2003, a second federal-provincial program was announced that paid producers up to \$320 per cow when their cull animals were sold for slaughter. The federal government was committed \$120 million as base funding for all regions cost shared the program with provincial and territorial governments on a 60-40 basis, which brought total funding for this program to \$200 million (Agriculture and Agri-Food Canada, 2003).

On March 22, 2004 the federal government announced that a \$680 million Transitional Industry Support Program for cattle producers. The program provided direct payment of up to \$80 per head in inventory as at December 23, 2003. In addition, the program provided \$250 million in general transition payments to producers to address income challenges.

With input from the provinces, territories, the Canadian Cattlemen's Association, and other industry groups, a second federal only program was announced on September 10, 2004 aimed at reposition Canada's livestock industry. Federal transfers of \$488 million were made to subsidize BSE surveillance testing (producers were eligible for reimbursement of up to \$225 per testable sample, provincially inspected abattoirs were eligible for \$75 per head and renderers received \$50 per sample) and to encourage producers from marketing cattle and calves on feed.

On March 29, 2005 the federal government announced the \$995 million Federal Income Payment Program. This was the third federal only program in less than two years which entitled producers to received a per head payment on their inventory as of December 23, 2003. Payments were made at a rate of \$19 per head for cattle, \$68 per head for bison, \$34 per head for elk, \$17 per head for deer and \$14 per head for goats and sheep. A total of \$300 million was available cattle producers and another \$21 million for producers of the other animals listed.

In addition to the above programs, several provincial governments devised separate, provincial only programs. In Alberta for example, there were nine Alberta-only BSE compensation programs announced between June 25, 2003 and June 4, 2004. Table 4 shows the eight of the provincial programs covered 972,721 animals and transfers were made to 22,312 enterprises on a per animal basis. The total sum transferred to livestock producers was over \$400 million of which and was the subject of a major audit (Auditor General of Alberta, 2004). The ninth provincial only program was an \$8 million transition program for ruminants other than cattle announced on December 29, 2004.

In terms of the number of programs and amounts transferred, Ontario provides an example of more limited intervention by the provincial government. Table 5 summarizes the \$50 million in provincial-only programs in Ontario which subsidized set aside and slaughtering activities.

Table 4: Government Transfers in Alberta as of June 4, 2004

Program Name	Date Announced	Forecast Expenditure	Number of Applications	Number of Animals Covered	Dollars Transferred	Funding Structure
Canada-Alberta BSE Recovery Program	June 18, 2003	\$297,046,000	4,369	478,024	\$248,091,473	Federal (60%) Provincial (40%)
Alberta Fed Cattle Competitive Bid Program	July 25, 2003	\$60,909,000	423	106,750	\$58,527,130	Alberta (100%)
Alberta Fed Cattle Competitive Market Adjustment Program	August 25, 2003	\$66,606,000	979	149,991	\$64,862,978	Alberta (100%)
Alberta BSE Slaughter Market Adjustment Program for other Ruminants	September 23, 2005	\$3,000,000	1,014	36,975	\$1,443,340	Alberta (100%)
Alberta Steer and Heifer Market Transition Program	October 9, 2003	\$55,000,000	975			Alberta (100%)
Beef Product and Market Development Program	October 24, 2003	\$8,000,000				Alberta (100%)
Food Processor Assistance Initiative	October 24, 2003	\$400,000	7			Alberta (100%)
Alberta Mature Market Animal Transition Program	November 24, 2003	\$60,000,000	22,565	146,317	\$26,051,449	Alberta (100%)
Winter Feed Program for deer, elk, llama and alpaca producers	November 24, 2003	\$4,000,000	734	54,744	\$3,906,257	Alberta (100%)
TOTAL		\$554,964,000		972,721	\$402,882,627	

Source: Auditor General of Alberta, 2004.

Table 5: BSE Recovery Programs in Ontario

Program	Total Number of Animals Covered	Total Payments in Ontario	Comments
Canada Ontario BSE Recovery Program	184,000	\$ 82 million	<ul style="list-style-type: none"> • Cost-shared 60/40 federal/provincial • All ruminants covered (fed cattle, cows, sheep, goats, cervids, etc.)
Ontario BSE Recovery Initiative - (Set-aside)	45,000	\$18 million	<ul style="list-style-type: none"> • Provincial only • Fed cattle
Ontario BSE Recovery Initiative - (Slaughter)	39,000	\$10.7 million	<ul style="list-style-type: none"> • Provincial only • Fed cattle & veal
Ontario BSE Recovery Initiative - (Advance Payment)	Not applicable	\$19.7 million	<ul style="list-style-type: none"> • All ruminants covered (fed cattle, cows, sheep, goats, cervids, etc.)
Total number of producers paid under the three BSE recovery programs: 16,000			

Source: Ontario Ministry of Agriculture, Food and Rural Affairs (2005).

http://www.omafra.gov.on.ca/english/policy/bserp/Previous_BSE_Programs_index.html

Between May 2003 and May 2005, more than \$2 billion was transferred by federal and provincial governments in the form of BSE assistance. The redistributive implications of this costly undertaking can be deduced, but not easily quantified. Our approach identifies the major components of losses to the beef sector and eliminates problems associated with accruals and distribution. Consequently, total losses from BSE in Canada (i.e., including and beyond the beef sector) are necessarily larger than our estimates.¹⁰

4. Empirical Analysis

The losses to the beef sector in Canada from BSE were the result of increased costs imposed on producers, handlers and processors to comply with regulations for handling and slaughtering cattle and from a reduction in export opportunities for cattle, beef, and by-products. This section quantifies these losses using the conceptual framework developed in the previous section.

¹⁰ In addition to lower market returns, there also were significant physic costs (i.e., like stress) to producers from disrupted marketing activities, consumer worry about food safety, and concerns of bureaucrats about choosing the appropriate response to the crisis. These costs clearly took a toll, but cannot be quantified or aggregated across individuals.

4.1. Losses From Increased Costs

Additional resources had to be withdrawn from other uses to comply with new government requirements for handling and slaughtering cattle. The costs of these activities represent a clear economic loss during the two year period under investigation.

As a result of new handling, slaughtering and processing requirements imposed by the Canadian Food Inspection Agency, packers in Canada had to change some of their procedures. The specialized procedures which added costs to packer operations related to the following activities:

- Stunning
- Head removal
- Dentition examination
- Head separation
- Removal of the skull, brain, trigeminal ganglia, eyes, and tonsils
- Removal of the distal ileum
- Carcass splitting
- Removal of the spinal cord
- Chilling and storage of carcasses from cattle over thirty months of age
- Removal of the dorsal root ganglia
- Handling of knives
- Packaging and labeling
- General handling of specified risk materials

The Auditor General of Alberta's report on the government's BSE-related assistance programs estimated that these new requirements increased packing costs by \$25 to \$35 per head.¹¹ According to the Auditor General of Alberta these costs could reduce the packers' normal net earnings before corporate interest and income taxes by about 50%, all other things the same (Auditor General of Alberta, 2004).

According to Canfax (2003, 2004, 2005), 6.4 million head of cattle were slaughtered in Canadian packing plants between May 2003 and May 2005. Using the average estimated increase per head cost of slaughtering of \$30, increased costs over this period totaled \$240 million.

¹¹ It has been suggested that subsequent plant and process changes will yield future benefits. While speculating what might be the size or the extent of these benefits is beyond the scope of the paper, it is clear there can be no overall net benefit. With export markets partially or completely closed, had the owners of slaughtering plants perceived the existence of a positive, discounted net present value from increased capacity and modified processing methods, these would have been adopted by them to satisfy the wants of final consumers without any further government interference. As the owners of processing plants did not anticipate net benefits (in fact, in view of perceived losses they reduced output and employment during the summer of 2003), governments chose to promote an outcome of expanded capacity and specific processing activities through various transfer schemes and regulations. Encouraging this or any other pattern of production creates an overall net loss.

4.2. Losses from Import Bans

4.2.1. Live Animal Trade

Processors and consumers in the United States were not able to import Canadian cattle between May 20, 2003 and July 14, 2005. Table 6 reveals the import ban had the effect of reducing the returns from exports from more than \$1.8 billion (1.6 million head) in 2002 to \$590 million (500,000 head) in 2003, \$0 (0 head) in 2004. Before the BSE crisis by comparison, typical export returns were about \$1.65 billion. From July 14, 2005 when it once again became possible to ship live cattle to the United States to November 30, 2005, exports of live animals totaled \$515 million (463 million head). Table 7 shows the average returns to Canadian exporters as at Nov 2005 (\$1113.97/head) were slightly higher than the average return in 2002 (\$1083.40).

As the inventory of cattle increased relative to slaughter capacity between May 2003 and May 2005, domestic prices fell. When news broke on May 20th that the United States government had banned Canadian imports, cattle futures prices on the Chicago Mercantile Exchange dropped the daily 1.5-cent limit. Fed cattle prices collapsed all across Canada. In Ontario, fed steer prices went from \$109/cwt before the border closed to \$76/cwt in five weeks and then to \$34/cwt by late July. Cull prices fared even worse over the same time period, dropping 80% to \$12/cwt.

These low domestic prices for cattle had the effect of reducing the quantity of imported live cattle into Canada. Compared to the close to \$80 million worth of live cattle imports in 2002, Table 8 shows that imports fell by \$44 million to \$36 million in 2003 and by \$76 million to only \$3 million in 2004. During the first eleven months of 2005, imports remained below \$6 million.

Taking the gross losses from the import bans on live cattle and adjusting for the reduction in live cattle imports, the net loss from May 2003 and May 2005 totals \$4.222 billion. Losses from live cattle exports are estimated to be \$1.21 billion from May to December 2003, \$1.65 billion in 2004 and \$1.21 billion for the first five months of 2005. Over the same time periods, imports fell by \$44 million, \$76 million and \$35 million, respectively.

4.2.2. Beef and By-product Trade

When foreign governments banned imports of Canadian origin beef and cattle in May 2003, packers immediately lost almost half of their market for beef. The effect on the demand for by-products, including hides, edible and inedible offal, was more devastating. Packers responded quickly by operating at half capacity and laying off employees.

To support the stunned and beleaguered industry, a blitz of ad campaigns and appeals from politicians encouraged Canadians to continue buying "Canadian beef."

Table 6: Live Animal Exports

	RETURNS ('000 \$)				QUANTITY (Number)			
Month	2002	2003	2004	2005-Nov	2002	2003	2004	2005-Nov
Jan	\$128,151	\$135,932	0	0	114,045	118,138	0	0
Feb	\$165,285	\$122,796	0	0	143,213	105,793	0	0
Mar	\$162,418	\$139,668	0	0	135,334	118,184	0	0
Apr	\$164,856	\$136,720	0	0	134,719	114,176	0	0
May	\$123,711	\$55,865	0	0	105,774	49,388	0	0
Jun	\$114,830	0	0	0	102,626	0	0	0
Jul	\$116,780	0	0	\$16,549	113,329	0	0	15,644
Aug	\$162,637	0	0	\$87,440	153,850	0	0	79,967
Sep	\$183,229	0	0	\$126,447	184,239	0	0	116,533
Oct	\$186,622	0	0	\$150,195	196,672	0	0	133,172
Nov	\$186,698	0	0	\$135,401	183,850	0	0	117,922
Dec	\$133,397	0	0		120,190	0	0	
TOTAL	\$1,828,614	\$590,990	\$0	\$516,033	1,687,841	505,689	0	463,238

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 7: Average Returns From Exports, \$/head

Month	2002	2003	2004	2005-Nov
Jan	\$1,123.69	\$1,150.62	\$0.00	\$0.00
Feb	\$1,154.12	\$1,160.72	\$0.00	\$0.00
Mar	\$1,200.13	\$1,181.78	\$0.00	\$0.00
Apr	\$1,223.70	\$1,197.45	\$0.00	\$0.00
May	\$1,169.58	\$1,131.15	\$0.00	\$0.00
Jun	\$1,118.92	\$0.00	\$0.00	\$0.00
Jul	\$1,030.45	\$0.00	\$0.00	\$1,057.88
Aug	\$1,057.11	\$0.00	\$0.00	\$1,093.45
Sep	\$994.52	\$0.00	\$0.00	\$1,085.08
Oct	\$948.90	\$0.00	\$0.00	\$1,127.83
Nov	\$1,015.49	\$0.00	\$0.00	\$1,148.23
Dec	\$1,109.89	\$0.00	\$0.00	
Year	\$1,083.40	\$1,168.68	\$0.00	\$1,113.97

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 8: Expenditures on Live Cattle Imports

	2002	2003	2004	2005-Nov
TOTAL	\$79,895,926	\$36,797,416	\$3,166,891	\$5,256,629

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

These appeals were largely successful, and according the Auditor General of Alberta, Canadians actually consumed five percent more beef in 2003 than they had in 2002.

Retail prices for beef remained substantially unchanged through the summer of 2003. Prices were sustained further when the United States Department of Agriculture readmitted imports of boneless beef muscle cuts and veal from Canada on September 10, 2003. While returns generated from beef exports returned to pre-BSE levels, export opportunities for by-products remained limited.

Beef and Veal Trade

With the exception of the 114 days between May 20 and September 10, 2003, beef exports from Canada were just slightly lower than pre-BSE levels. Table 9 shows that export earnings for beef and veal totaled \$2.22 billion in 2002 (521 million kg), \$1.462 billion in 2003 (324 million kg), \$1.921 billion in 2004 (454 million kg) and for the first eleven months of 2005 \$1.714 billion (424 million kg). Table 10 reveals that compared to 2002, average returns from exported beef and veal were actually \$0.24/kg higher in 2003, \$0.02/kg lower in 2004 and \$0.22/kg lower in 2005.

Under World Trade Organization rules, the Canadian government must allow offshore imports of 76,409 tonnes of fresh, chilled and frozen beef. Importers can exceed that limit with a government-granted supplementary import permit. By the end of July 2003, imports were close to 100,000 tonnes or 30 percent above what is supposed to be the annual limit. Complaints from the cattle industry convinced the federal government to suspend issuance of supplementary import permits in July. The suspension has remained in effect since and consumer expenditures on beef and veal imports have fallen. Table 11 shows that compared to 2002, beef and veal imports fell by \$81 million in 2003, \$492 million in 2004 and \$188 million during the first eleven months of 2005. Thus, taking the gross losses from the import bans on beef and veal and adjusting for the reduction in imports, there was a net gain between May 2003 and May 2005 of \$221 million. Losses from beef and veal imports live cattle export are estimated to be \$540 million while gains from a reduction in imports totaled \$761 million.

By-product Trade

Fed cattle are primarily associated with the production of beef for human consumption, but in truth the number of products derived from cattle is extensive. Table 12 provides a partial listing of by-products derived from cattle after slaughter (thus excluding milk, semen and embryos) and some of their uses. While some of these by-products are further processed in Canada, a non-trivial proportion is exported. In 2002, exports of fresh, chilled and frozen offal totaled \$125 million; guts, bladders and stomachs totaled \$21million; frozen tongues totaled \$17 million; and frozen livers totaled \$10 million. Because of the import bans, export earnings from by-products have not returned to pre-BSE levels, with the exception of embryos.

Table 9: Beef and Veal Exports

Month	RETURNS ('000 \$)				QUANTITY ('000kg)			
	2002	2003	2004	2005-Nov	2002	2003	2004	2005-Nov
Jan	\$172,755	\$199,894	\$142,107	\$141,390	39,581	44,261	33,620	33,543
Feb	\$179,839	\$184,684	\$154,912	\$152,111	39,136	41,231	36,928	34,754
Mar	\$199,003	\$195,617	\$171,799	\$189,240	43,592	44,989	40,739	43,789
Apr	\$185,304	\$181,757	\$177,350	\$201,056	41,200	41,776	39,230	46,085
May	\$188,547	\$115,729	\$157,471	\$185,384	44,634	28,137	32,265	44,167
Jun	\$208,901	\$506	\$171,145	\$184,482	51,264	160	40,994	45,370
Jul	\$181,794	\$868	\$161,221	\$142,416	46,248	450	36,571	36,890
Aug	\$203,795	\$741	\$157,933	\$139,577	49,741	462	36,668	39,931
Sep	\$176,786	\$78,364	\$150,380	\$146,241	43,331	13,913	37,049	40,078
Oct	\$183,440	\$168,971	\$171,579	\$112,877	44,369	35,014	42,465	29,851
Nov	\$178,677	\$178,444	\$160,674	\$119,985	40,809	38,075	41,711	29,733
Dec	\$162,085	\$156,863	\$145,090		37,561	36,295	36,700	
TOTAL	\$2,220,927	\$1,462,440	\$1,921,662	\$1,714,758	521,467	324,765	454,940	424,190

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 10: Average Returns for Exported Beef and Veal, \$/kg

Month	2002	2003	2004	2005-Nov
Jan	\$4.36	\$4.52	\$4.23	\$4.22
Feb	\$4.60	\$4.48	\$4.20	\$4.38
Mar	\$4.57	\$4.35	\$4.22	\$4.32
Apr	\$4.50	\$4.35	\$4.52	\$4.36
May	\$4.22	\$4.11	\$4.88	\$4.20
Jun	\$4.08	\$3.17	\$4.17	\$4.07
Jul	\$3.93	\$1.93	\$4.41	\$3.86
Aug	\$4.10	\$1.60	\$4.31	\$3.50
Sep	\$4.08	\$5.63	\$4.06	\$3.65
Oct	\$4.13	\$4.83	\$4.04	\$3.78
Nov	\$4.38	\$4.69	\$3.85	\$4.04
Dec	\$4.32	\$4.32	\$3.95	
Year	\$4.26	\$4.50	\$4.22	\$4.04

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 11: Expenditures on Beef and Veal Imports, in '000\$

	2002	2003	2004	2005-Nov
TOTAL	\$787,737	\$706,236	\$295,868	\$337,621

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 12: A Partial Listing of By-Products and Their Uses

By-Product		Use
Head	Brain	(usually used in processed products, but also sold separately): human food, laboratory reagents, veterinary medicines, pharmaceuticals, cosmetics
	Ears	rendering
	Eyes	dissection in schools, laboratory reagents (retina)
	Head & cheek	human food, pet food
	Horns	gelatin, fire-extinguisher foam, buttons, handles, animal feed, fertilizer
	Lips	human food
	Pituitary	pharmaceuticals (growth hormones)
	Tongue	the root gland is also used to produce pregastric lipase, which is used in cheese production; human food, pet food, animal feed
	Tonsils	pet food
	Trachea	pet food, pharmaceuticals (chondroitin sulphate, used for the treatment of arthritis)
Meat	Fat	human food (suet, lard, margarine), toothpaste, ointments, topically applied medicines and cosmetic products, shortening, chewing gum, adhesives for animal feeds, lubricants, soap candles, glycerin
	Red Meat	human food, pet food
	Tail	human food
	Tendons	pharmaceuticals (for example, elastin, often used in ankle/knee support products, skeletal and cardiac muscle is also used to produce peptone, a cell culture ingredient)
Organs	Abomasum	human food (including rennet), pharmaceuticals (pepsin), pet food, animal feed
	Adrenal	pharmaceuticals (steroids), laboratory reagents
	Bladder	animal feed
	Gall	pharmaceuticals, cleaning agent in leather manufacture, paint and dye manufacture, also used by water colorists to improve the absorbency of paper
	Gallstones	pharmaceuticals
	Gut contents	fertilizer
	Heart	human food, medical devices (pericardium patches and heart valves), pet food, laboratory reagents
	Intestines, large	laboratory reagents, animal feed
	Intestines, small	human food (casings), pharmaceuticals (glycosaminoglycans, used for the treatment of cartilage and joints), sutures, laboratory reagents, racquet strings, musical instrument strings
	Kidneys	human food, pet food
	Liver	human food, pet food, pharmaceuticals (liver digest cell culture ingredient, contact lens care products use the enzyme catalase)
	Lungs	pet food, pharmaceuticals (heparin, an anticoagulant also found in other tissues), surfactant
	Lymph nodes	human food, pet food

Organs	Oesophagus	human food (casings), pet food, animal feed
	Omasum	human food, pet food
	Pancreas	pharmaceuticals (insulin, chromotrypsin and glucagons), human food ('sweetbread" together with the thymus)
	Placenta	pharmaceuticals (glycosamine, alkaline phosphatases, manufacture of fetal calf serum), cosmetics
	Reproductive organs	pharmaceuticals (testicles are made into hyaluronidase used in the treatment of cartilage and joints), pet food
	Reticulum	human food (tripe), pet food, animal feed
	Rumen	human food (tripe), pet food, animal feed
	Skirt (diaphragm)	human food
	Spleen	human food, pet food, pharmaceuticals, cosmetics
	Thymus	human food (as in 'sweetbread' together with the pancreas), cosmetics
	Udder	human food, pet food, pharmaceuticals
	Umbilical	pharmaceuticals (hyaluronic acid)
	Uterus	pharmaceuticals (glycosaminoglycans)
Skeleton	Bones	tallow, gelatin, candles, glue, buttons, handles, bone meal, adhesives for animal feed, lubricants, pet food, soap, glycerine, pharmaceuticals, surgical implants
	Spinal cord	cholesterol, neural lipids (used in the pharmaceutical industry and as a laboratory reagent)
Blood	Blood	human food (black pudding), pharmaceuticals (serum albumin base for many vaccines, fetal calf serum in the manufacture of vaccines as cell culture medium), surgical implants, pet food, adhesives for animal feed (made with bloodmeal), leather preparation (uses blood albumin), glue (made using bloodmeal), fertilizer (made using bloodmeal), fire-extinguisher foam (made using bloodmeal), mordant (uses blood albumin)
	Leukocytes	growth factors
	Plasma	fire-extinguisher foam, pharmaceuticals
	Red cells	pharmaceuticals
Skin/Hide	Skin/hide	gelatin, pharmaceuticals, collagen, leather, felt (from hair), fertilizer
Feet	Feet/hooves	gelatin, human food, pet food, glue, buttons, handles, neatsfoot oil, lubricants, cow-heel jelly, bone meal, fire extinguisher foam, fertilizer
Fluids	Bile	bile acids (used in the manufacture of industrial detergents), bilirubin (used as a measure of liver function)
	Nasal septum	pharmaceuticals (chondroitin sulphate)

Source: Ministry of Agriculture, Fisheries and Food. 2000. "Uses Made of the Cattle Carcass" in Chapter 4, Volume 16 in *The Inquiry into BSE and Variant CJD in the United Kingdom*.

<http://www.bseinquiry.gov.uk/report/volume16/chapter4.htm>. Accessed March 2006.

Figures 2 through 7 illustrate export earnings from selected by-products from 2002 to 2005. Except for liver exports, a discernable pattern is the decrease in earnings from 2002 to 2004 with a rebound in 2005. With regard to edible bovine offal, there was a decrease in the volume and value of exports to historically important markets in United States, Japan and Korea while exports increased to Poland, Mexico and Macau.

Bovine tongue exports fell more than 50% compared to pre-BSE levels. Sales to Japan and the United States, which had totaled more than \$16 million in 2002, generated less than \$4,000 in earnings during the first seven months of 2005. Tongue exports to Mexico, Macau and South Korea have increased.

Frozen liver exports also have fallen by about half. More than \$6 million of frozen livers were exported to Russia and Peru in 2002, but by 2005, exports to these regions had fallen to zero. Cuba, Moldova and Poland have since become important export markets for frozen livers produced in Canada.

Embryo exports have increased since the discovery of BSE and this has helped, in a small way, to offset losses elsewhere. Returns since 2002 have increased from \$3.5 million to \$6.3 million during the first 11 months of 2005.

The reduction in by-product exports had the effect of reducing prices in the domestic market and reducing the quantity of imported into Canada. Compared to typical levels, between May and December 2003, by-product imports fell \$5 million, \$28 million in 2004, and by \$10 million between January and May 2005.

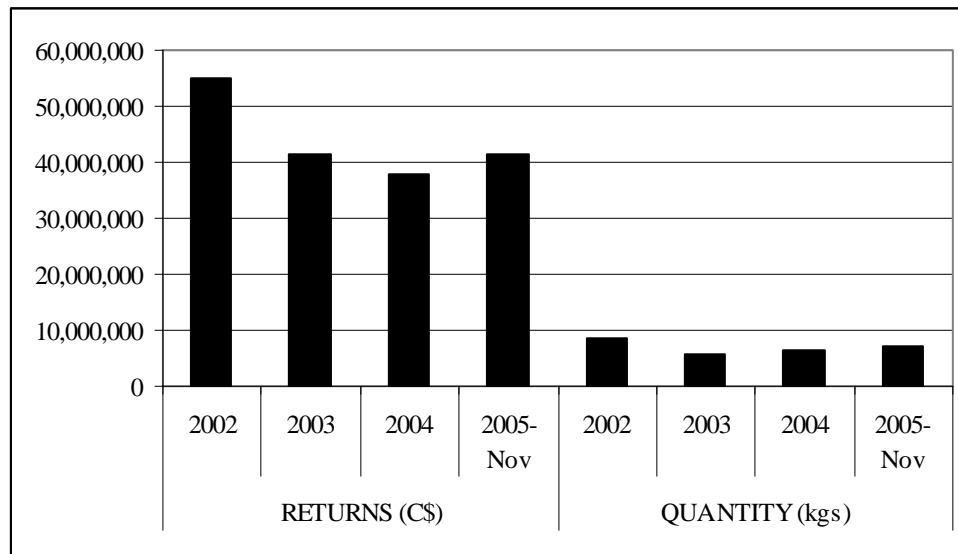
4.3. Summary

Table 13 summarizes the estimated \$4,062 million loss to the Canadian beef sector during the two year period from May 2003 to May 2005. During this period, increased costs from processing are estimated to be \$240 million. Losses from reduced net exports of live animals totaled \$3,918 million. Restricting the quantity of imported beef in Canada broadened the market for domestically produced beef and generated a net gain to the industry of \$221 million. Finally, the net losses in the market for by-products totaled \$125 million.

5. Concluding Remarks

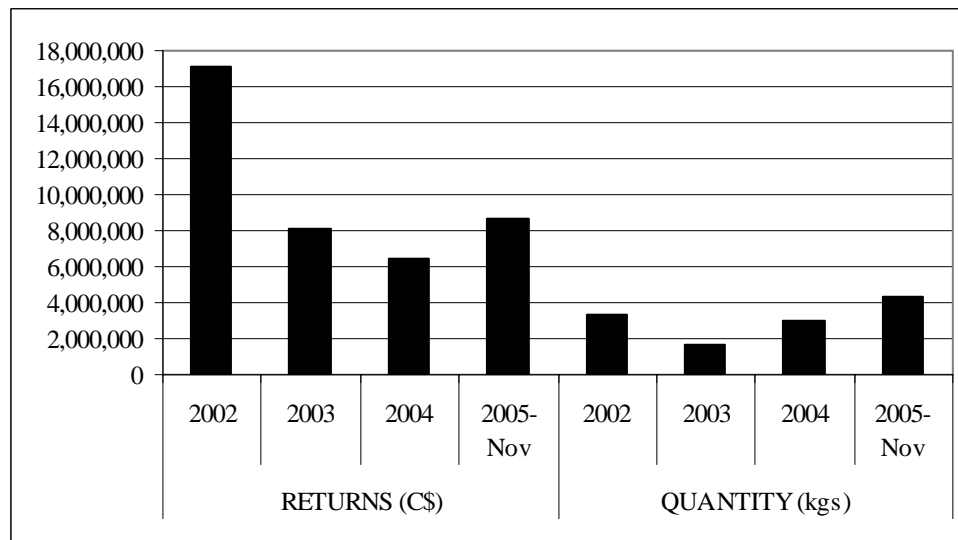
The appearance of BSE in the Canadian beef herd brought immediate financial hardship to the industry due to the immediate closure of export outlets to Canadian beef, live animals and by-products. Nobody knew how long the border would stay closed and many worried that the Canadian beef industry could not survive a prolonged disruption of markets for beef. Previously, producers in Canada had enjoyed secure access to markets for beef around the world, with most of the exports destined for the United States, Mexico, Japan and South Korea.

Figure 2: Export of Bovine Edible Offal, Fresh or Chilled



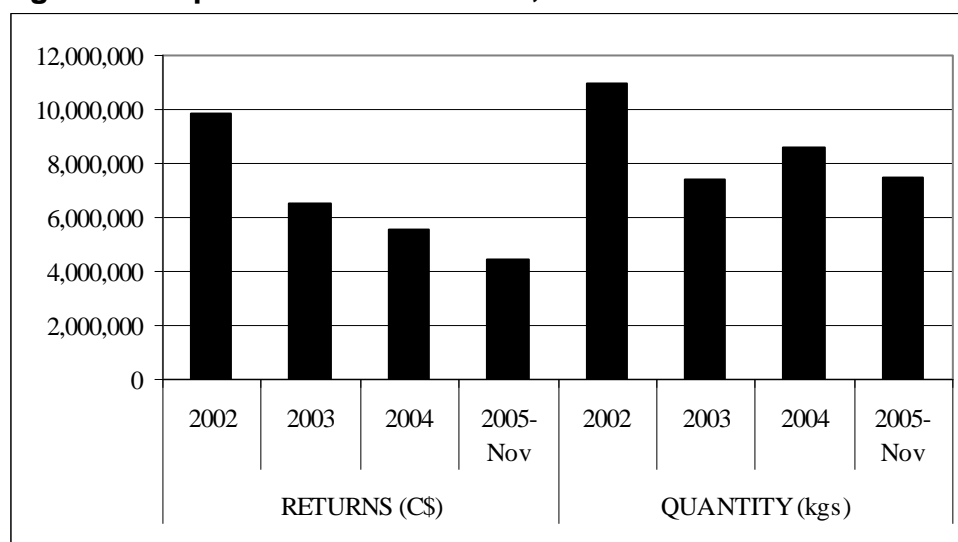
Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Figure 3: Exports of Bovine Tongues, Frozen



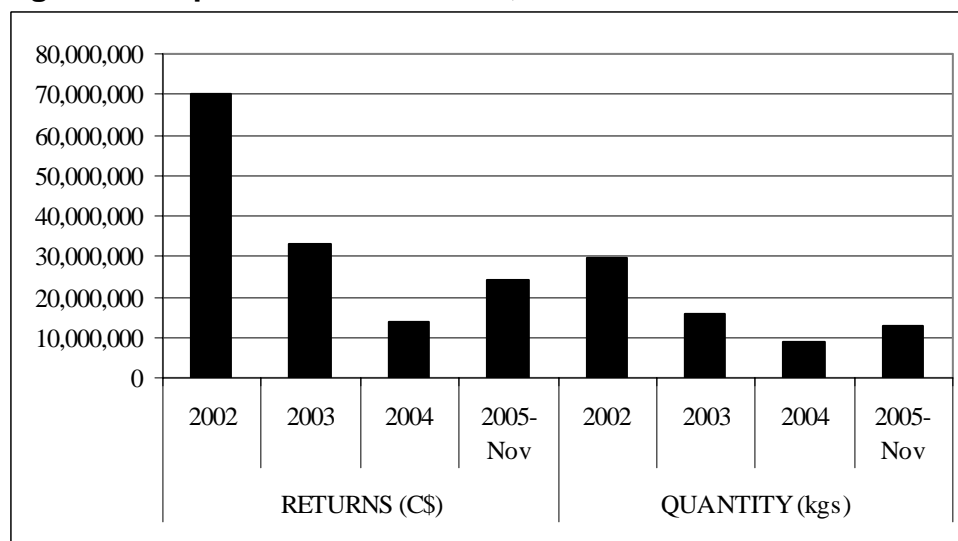
Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Figure 4: Exports of Bovine Livers, Frozen



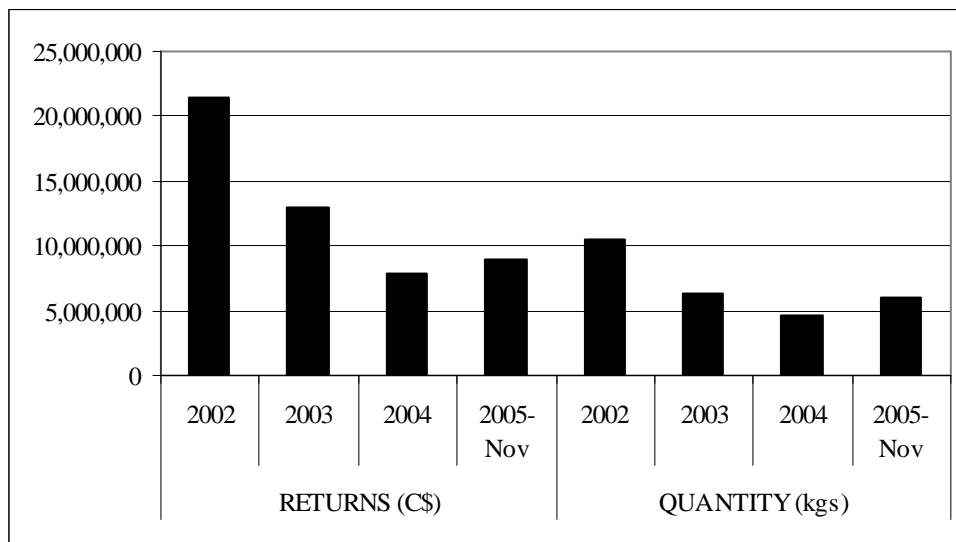
Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Figure 5: Exports of Bovine Offal, Frozen



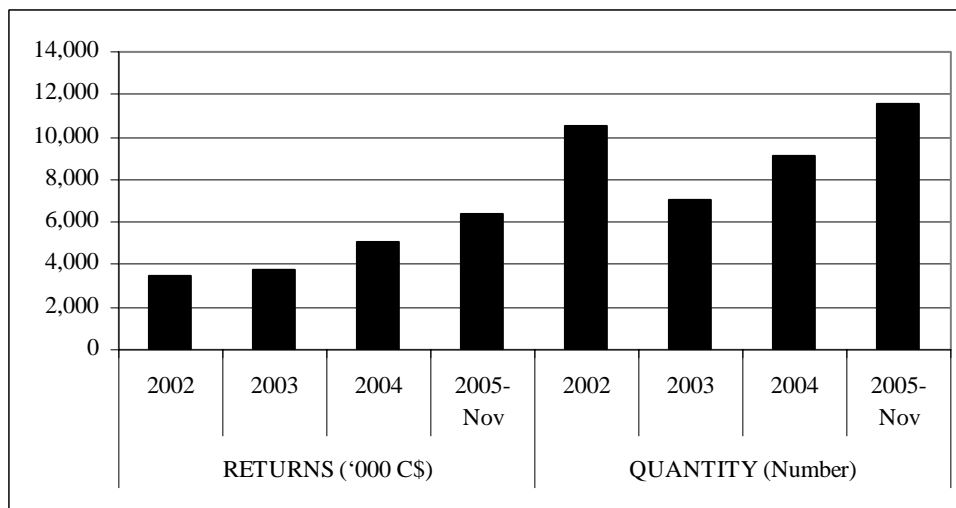
Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Figure 6: Exports of Guts, Bladders and Stomachs



Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Figure 7: Exports of Embryos



Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 13: Losses from BSE

	May- Dec 2003	2004	Jan-May 2005	TOTAL
Extra processing costs (@ \$30/head)	\$45M	\$120M	\$75M	\$240M
Number of Head	1.5M	4M	1.9M	
Reduced Exports				
Live Animals (@ \$1100/head)	\$1,210M	\$1,650M	\$1,210M	\$4,070M
Number of Head	1.1M	1.5M	1.1M	
Beef (@\$4.50/kg)	\$540M			\$540M
Number of kg	120M kg			
Byproducts (@ \$84M/Year)	\$49M	\$84M	\$35M	\$168M
Reduced Imports				
Live Animals	(\$44M)	(\$76M)	(\$32M)	(\$152M)
Beef	(\$81M)	(\$492M)	(\$188M)	(\$761M)
Byproducts	(\$5M)	(\$28M)	(\$10M)	(\$43M)
TOTAL				<u>\$4,062M</u>

Both federal and provincial governments quickly developed assistance programs and, over the next two years, transferred about \$2 billion to various sectors of the beef industry. Government subsidies certainly helped the beef sector but industry representatives argued that it did not cover nearly all the losses that had occurred. This is consistent with the results of this study.

There had been much speculation, primarily in the news media, about the amount of loss that has been incurred as a result of the BSE problem in Canada. One prominent outlet reported a loss of over \$7 billion. This study attempts to bring some clarity to the subject of total losses to Canada during the two year period following the discovery of BSE in Canada. The total losses were calculated as the reduction in value of exports of beef and live animals (less any drop in imports), plus the reduction in exports of beef by-products, plus the cost of extra processing required to implement new procedures, plus the cost of transferring subsidies to different participants of the

beef production chain. The distribution of these costs (and benefits) is inherently difficult to compute and no attempt to do so was made in this study.

The losses to the Canadian beef sector from BSE between May 2003 and May 2005 were estimated to be \$4,062 million. The results suggested the reduction in value of net exports of live cattle was \$3,918 million. Restricting the quantity of imported beef in Canada broadened the market for domestically produced beef and generated a net gain to the industry of \$221 million. Finally, the net losses in the market for by-products totaled \$125 million. The increased costs of the newly implemented slaughtering and processing methods were estimated over the two year period as \$240 million. Comparing the returns generated from important export markets reveal that between 2002 and 2004, the export value to the United States decreased by nearly \$2 billion (53%); to Mexico, it increased by \$154 million (74%); and to Japan and Korea, it decreased by \$81 million (91%) and \$50 million (98%), respectively.

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Statistical Appendix

A.1. Canadian Exports by Product Category

All cattle and beef export data in this appendix is reported by Statistics Canada under the listed Harmonized System (HS) eight-digit code numbers. Beef export data has been aggregated by product, by country. Information has been listed on an annual basis since 2002, except for 2005, for which data was available only until July of that year. Values are listed in decreasing order of export value as listed for the year 2002. Live cattle export values, listed in Table 14, have been recorded on a head number basis, unlike the slaughtered cattle exports which have been summarized by weight (TNE) in Table 15. Revenue for categories listed for live cattle exports can be found in Table 16, with a summarized total of live and slaughtered beef export goods in Table 17.

A.2. Cattle Exports by Category

A.2.1. Live Cattle Exports

Table 14 reveals details about live cattle exports and they are listed according to the number of cattle exported by category. Cows, steers, and heifers ready for immediate slaughter, and weighing 320kg or more, come in as the top three exports categories in both 2002, and 2003. However, in 2003 these exports decreased by 63%, 69%, and 62%, respectively. There was a drop of 96% in the number of live females (exc. dairy) exported weighing between 200 and 300 kg. Exports of live dairy cattle less than 90kg were reduced to zero after May 20, 2003. By 2004, no live cattle were exported out of Canadian boundaries. A year later, when borders reopened steers weighing more than 320kg for immediate slaughter took the lead in total export number, accounting for 34% of total number of head exported for the year. This is followed closely by male and female bovine weighing more than 320kg.

In summary, total cattle exports dropped by about 70% from 2002 to 2003, 100% from 2003 to 2004, and only increase in 2005 to a mere 3% of live export transactions in 2003.

A.2.2. Value of Live Exports

Table 15 lists in decreasing order revenues earned from various live cattle exports. The top three exports were steers, heifers, and cows weighing more than 320kg. In 2003, while the same weight of percentage of total value exported, there was an overall around 68% decrease in total export earnings. This varies per category, however, for the top three listings that have been discussed; the decrease is seen to be near that value (68%, 59%, and 61%, respectively). There were no exports of live cattle in 2004. When borders reopened 50% of the total export revenue was generated from over 320kg, 18% is accounted for by male bovines and 17% by female bovines—both of more than 320kg. The top three categories in 2005 make up \$85 million of the total revenue from live exports, whereas the top three categories in 2002 aggregated to a

Table 14: Live Cattle Exports

HS	PRODUCT DESCRIPTION (number of head)	2002	% of exports 2002	2003	% of exports 2003	2004	2005-Jul	% of exports 2005
01029063	Cows nes, exec dairy, for immediate slaughter, weighing 320 kg or more	372,295	22.06%	136,161	26.93%	0	177	1.13%
01029061	Steers nes, exc dairy, for immediate slaughter, weighing 320 kg or more	346,237	20.51%	106,506	21.06%	0	5,286	33.79%
01029064	Heifers nes, exec dairy, for immediate slaughter, weighing 320 kg or more	248,399	14.72%	94,371	18.66%	0	194	1.24%
01029091	Bovine, male, nes, exc dairy, weighing 320 kg or more	143,095	8.48%	51,342	10.15%	0	4,355	27.84%
01029051	Bovine male, live, nes exc dairy weighing 200 kg or more but less than 320 kg	114,675	6.79%	6,518	1.29%	0	277	1.77%
01029052	Bovine female, live, nes, exc dairy, weighing > 200 kg but < 320 kg	107,041	6.34%	4,512	0.89%	0	297	1.90%
01029041	Bovine male, live, nes, exc dairy, weighing 90 kg or more but less than 200 kg	93,678	5.55%	23,561	4.66%	0	152	0.97%
01029092	Bovine female, exc dairy, weighing 320 kg or more	81,901	4.85%	29,463	5.83%	0	4,570	29.21%
01029012	Bovine, live, nes, dairy weighing 90 kg or more	61,628	3.65%	23,741	4.69%	0	85	0.54%
01029062	Bulls nes, exc dairy, for immediate slaughter, weighing 320 kg or more	57,448	3.40%	17,006	3.36%	0	5	0.03%
01029042	Bovine female, live, nes, exc dairy, weighing > 90 kg but < 200 kg	34,536	2.05%	1,022	0.20%	0	0	0.00%
01029032	Bovine female, live, nes, exc dairy, weighing less than 90 kg	7,812	0.46%	1,864	0.37%	0	0	0.00%
01029072	Bovine, female, nes, exc dairy, for breeding, weighing 320 kg or more	7,695	0.46%	2,519	0.50%	0	0	0.00%
01021012	Bovine, female, live, pure-bred, breeding, dairy	7,556	0.45%	3,469	0.69%	0	0	0.00%
01029071	Bovine, male, nes, exc dairy, for breeding, weighing 320 kg or more	2,409	0.14%	1,690	0.33%	0	0	0.00%
01021092	Bovine, female, live, pure-bred, breeding, exc dairy	651	0.04%	1,647	0.33%	0	0	0.00%
01021091	Bovine, male, live, pure-bred, breeding, exc dairy	246	0.01%	224	0.04%	0	0	0.00%
01021011	Bovine, male, live, pure-bred, breeding, dairy.	197	0.01%	63	0.01%	0	0	0.00%
01029011	Bovine, live, nes, dairy weighing less than 90 kg	180	0.01%	0	0.00%	0	246	1.57%
01029031	Bovine male, live, nes, exc dairy, weighing less than 90 kg	162	0.01%	10	0.00%	0	0	0.00%
TOTAL		1,687,841	100.00%	505,689	100.00%	0	15,644	100.00%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 15: Value of Live Cattle Exports

HS	PRODUCT DESCRIPTION (in '000\$)	2002	% of exports 2002	2003	% of exports 2003	2004	2005-Aug	% of exports 2005
01029061	Steers nes, exc dairy, for immediate slaughter, weighing 320 kg or more	\$478,916	26.19%	\$154,197	26.08%	\$0	\$49,922	49.93%
01029064	Heifers nes, exc dairy, for immediate slaughter, weighing 320 kg or more	\$329,332	18.01%	\$134,057	22.68%	\$0	\$11,106	11.11%
01029063	Cows nes, exc dairy, for immediate slaughter, weighing 320 kg or more	\$299,008	16.35%	\$116,092	19.64%	\$0	\$693	0.69%
01029091	Bovine, male, nes, exc dairy, weighing 320 kg or more	\$146,178	7.99%	\$52,897	8.95%	\$0	\$18,015	18.02%
01029012	Bovine, live, nes, dairy weighing 90 kg or more	\$115,678	6.33%	\$39,747	6.72%	\$0	\$74	0.07%
01029051	Bovine male, live, nes exc dairy weighing 200 kg or more but less than 320 kg	\$88,246	4.83%	\$4,642	0.79%	\$0	\$2,629	2.63%
01029092	Bovine female, exc dairy, weighing 320 kg or more	\$80,376	4.40%	\$28,817	4.87%	\$0	\$16,648	16.65%
01029052	Bovine female, live, nes, exc dairy, weighing > 200 kg but < 320 kg	\$79,109	4.33%	\$3,266	0.55%	\$0	\$445	0.45%
01029062	Bulls nes, exc dairy, for immediate slaughter, weighing 320 kg or more	\$77,833	4.26%	\$23,064	3.90%	\$0	\$69	0.07%
01029041	Bovine male, live, nes, exc dairy, weighing 90 kg or more but less than 200 kg	\$74,330	4.06%	\$18,207	3.08%	\$0	\$360	0.36%
01029042	Bovine female, live, nes, exc dairy, weighing > 90 kg but < 200 kg	\$18,625	1.02%	\$596	0.10%	\$0	\$0	0.00%
01021012	Bovine, female, live, pure-bred, breeding, dairy	\$17,160	0.94%	\$5,112	0.86%	\$0	\$0	0.00%
01029072	Bovine, female, nes, exc dairy, for breeding, weighing 320 kg or more	\$11,450	0.63%	\$3,697	0.63%	\$0	\$0	0.00%
01029071	Bovine, male, nes, exc dairy, for breeding, weighing 320 kg or more	\$5,591	0.31%	\$3,272	0.55%	\$0	\$0	0.00%
01029032	Bovine female, live, nes, exc dairy, weighing less than 90 kg	\$3,933	0.22%	\$853	0.14%	\$0	\$0	0.00%
01021092	Bovine, female, live, pure-bred, breeding, exc dairy	\$1,646	0.09%	\$1,756	0.30%	\$0	\$0	0.00%
01021011	Bovine, male, live, pure-bred, breeding, dairy.	\$591	0.03%	\$574	0.10%	\$0	\$0	0.00%
01021091	Bovine, male, live, pure-bred, breeding, exc dairy	\$493	0.03%	\$331	0.06%	\$0	\$0	0.00%
01029011	Bovine, live, nes, dairy weighing less than 90 kg	\$215	0.01%	\$0	0.00%	\$0	\$12	0.01%
01029031	Bovine male, live, nes, exc dairy, weighing less than 90 kg	\$73	0.00%	\$3	0.00%	\$0	\$0	0.00%
TOTAL		\$1,828,796	100.00%	\$591,190	100.00%	\$0	\$99,979	100%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

total of over \$1.1 billion. Realizing that the year of 2005 has only had just over half of its year accounted for, total revenue of exports is increasing, however, for a comparison of what has been valued so far, it can be seen that from 2002, revenue from live exports has declined nearly 95%, or \$1.7 billion dollars.

A.3. Beef and By-product Exports by Category

A.3.1. Beef and By-product Exports

Tables 16 and 17 reveal beef and by-product exports in quantity and value terms. Although there are many beef and by-products exported from Canada. From 2002 to 2005, “fresh or chilled bone-in and boneless cuts” accounted for the largest quantity of exports, followed by “waste and scrap for animal feed” and “frozen boneless cuts”. Fresh or chilled bone-in cuts were not a highly exported product in 2004 and 2005. Their ranking, then, is replaced by “frozen bovine edible offal” at a two percent value of total export weight. However, over the course of the four years, the highest four exporting categories account for 86-92% of total weight of beef by-product exported.

A.3.2. Value of Total Live Cattle and Beef and By-product Exports

To compare products that generate the largest export earnings, it is necessary to provide a table that summarizes the revenue brought in by all the listed categories and their quantity of exports. As such, dollar values were gathered using the HS8 codes for product category description. During 2002, 92% of exports were drawn from only five categories, the first of which entails most of the live-cattle sector (43%), followed next by “fresh or chilled boneless cuts” (35%). Summing these two categories together accounts for a total of \$3.3 billion in 2003. The third export category – “fresh or chilled cuts with bone in” – shows a significant drop to 8% of total export value. “Salted, dried, or smoked meat” and “frozen boneless cuts” explain the next 6% of exports in 2002.

Similarly, in 2003 90% of exports be attributed to the same five categories. However, in 2003, “live cattle exports” dropped to second place standing, having lost \$1.2 billion dollars, or having been hit by a 67% decrease in revenue from 2002. Although total revenue from “fresh or chilled boneless cuts” decreased by 26%, they account for 48% of the total income received from the beef exports of 2003. From 2002 to 2003, total revenue dropped by nearly \$2 billion dollars, or 45%.

Again in 2004, 90% of export earnings were generated by the first five categories listed in order of 2002 values. Even though live cattle were no longer being exported, and thus were not generating any revenue in exports in 2004, the other four of the five categories listed in the top five for 2002, still sum to 90%. “Fresh or chilled boneless cuts”, although decreasing in both quantity and income from 2002 to 2003, increased in both weight exported and revenue generated in 2004. This accounts for just under \$1.7 billion, or 77% of total export value.

To mention once again, data for 2005 are only totaled for just over half of the year (July in the case of live cattle, and August in the case of beef and by-product).

Table 16: Quantity of Beef and By-Product Exports

HS	PRODUCT DESCRIPTION ('000kgs)	2002	% of exports 2002	2003	% of exports 2003	2004	% of exports 2004	2005-Jul	% of exports 2005
02013090	Bovine cuts boneless, nes, fresh or chilled	319,662	52.26%	227,242	58.32%	380,903	73.41%	238,953	74.81%
02012090	Bovine cuts bone in, nes, fresh or chilled	84,011	13.73%	28,779	7.39%	314	0.06%	124	0.04%
05119910	Meat waste and scrap for animal feed	78,136	12.77%	56,497	14.50%	54,594	10.52%	32,571	10.20%
02023000	Bovine cuts boneless, frozen	39,910	6.52%	25,920	6.65%	32,319	6.23%	17,512	5.48%
02062900	Bovine edible offal, frozen nes	29,588	4.84%	15,574	4.00%	8,657	1.67%	6,315	1.98%
02022000	Bovine cuts bone in, frozen	14,214	2.32%	5,154	1.32%	3,440	0.66%	2,105	0.66%
02062200	Bovine livers, edible offal, frozen	10,980	1.80%	7,378	1.89%	8,600	1.66%	4,455	1.39%
05040090	Guts, bladders and stomachs, nes, of animals, except fish, whole or in piece	10,443	1.71%	6,393	1.64%	4,689	0.90%	1,767	0.55%
02061000	Bovine edible offal, fresh or chilled	8,749	1.43%	5,869	1.51%	6,479	1.25%	4,660	1.46%
16025010	Bovine meat and meat offal nes, prepared meals	3,387	0.55%	1,060	0.27%	430	0.08%	247	0.08%
02062100	Bovine tongues, edible offal, frozen	3,387	0.55%	1,659	0.43%	2,995	0.58%	2,402	0.75%
16025090	Bovine meat and meat offal, nes, except in airtight containers	2,878	0.47%	1,413	0.36%	296	0.06%	218	0.07%
02011020	Veal carcasses and half carcasses, fresh or chilled	2,385	0.39%	3,518	0.90%	9,023	1.74%	6,155	1.93%
02089090	Meat and edible meat offal, fresh, chilled, or frozen, nes	1,168	0.19%	1,243	0.32%	1,639	0.32%	763	0.24%
02011090	Bovine (beef) carcasses and half carcasses, nes, fresh or chilled	936	0.15%	210	0.05%	15	0.00%	56	0.02%
02102000	Bovine meat cured	821	0.13%	599	0.15%	708	0.14%	367	0.12%
16029090	Meat, meat offal or blood, prepared or preserved, nes, exc in airtight container	400	0.07%	402	0.10%	250	0.05%	32	0.01%
02021090	Bovine (beef) carcasses and half carcasses, nes, frozen	280	0.05%	210	0.05%	482	0.09%	334	0.10%
16025020	Bovine meat and meat offal, nes, in airtight containers	249	0.04%	158	0.04%	243	0.05%	364	0.11%
02109990	Meat and edible meat offal, nes, cured including flours and meals	63	0.01%	317	0.08%	2,755	0.53%	3	0.00%
02021020	Veal carcasses and half carcasses, frozen	30	0.00%	22	0.01%	16	0.00%	1	0.00%
16029019	Meat, meat offal or blood, prepared or preserved, nes, in airtight container	20	0.00%	12	0.00%	57	0.01%	2	0.00%
TOTAL		611,697	100.00%	389,629	100.00%	518,905	100.00%	319,408	100.00%
OTHER	(by number)								
05119940	Cattle embryos	10,563		7,089		9,103		22,214	

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Continuation of Table: Quantity of Beef and By-Product Exports

PRODUCT DESCRIPTION (in '000kgs)	Difference 2003-2002	% change in quantity	Difference 2004-2003	% change in quantity	Difference 2004-Jul 2005	% change in quantity
Bovine cuts boneless, nes, fresh or chilled	(92,419)	-28.91%	153,661	67.62%	(141,950)	-37.27%
Bovine cuts bone in, nes, fresh or chilled	(55,231)	-65.74%	(28,465)	-98.91%	(190)	-60.42%
Meat waste and scrap for animal feed	(21,639)	-27.69%	(1,903)	-3.37%	(22,023)	-40.34%
Bovine cuts boneless, frozen	(13,990)	-35.05%	6,400	24.69%	(14,807)	-45.81%
Bovine edible offal, frozen nes	(14,014)	-47.36%	(6,917)	-44.41%	(2,343)	-27.06%
Bovine cuts bone in, frozen	(9,060)	-63.74%	(1,714)	-33.25%	(1,335)	-38.81%
Bovine livers, edible offal, frozen	(3,603)	-32.81%	1,223	16.57%	(4,145)	-48.20%
Guts, bladders and stomachs, nes, of animals, except fish, whole or in piece	(4,050)	-38.78%	(1,704)	-26.65%	(2,922)	-62.32%
Bovine edible offal, fresh or chilled	(2,880)	-32.92%	610	10.39%	(1,819)	-28.07%
Bovine meat and meat offal nes, prepared meals	(2,326)	-68.69%	(630)	-59.43%	(183)	-42.49%
Bovine tongues, edible offal, frozen	(1,728)	-51.03%	1,336	80.56%	(593)	-19.80%
Bovine meat and meat offal, nes, except in airtight containers	(1,465)	-50.89%	(1,117)	-79.07%	(77)	-26.19%
Veal carcasses and half carcasses, fresh or chilled	1,132	47.47%	5,505	156.49%	(2,868)	-31.79%
Meat and edible meat offal, fresh, chilled, or frozen, nes	75	6.42%	396	31.86%	(876)	-53.45%
Bovine (beef) carcasses and half carcasses, nes, fresh or chilled	(726)	-77.55%	(195)	-92.88%	41	272.81%
Bovine meat cured	(222)	-27.06%	110	18.33%	(341)	-48.13%
Meat, meat offal or blood, prepared or preserved, nes, exc in airtight container	2	0.50%	(152)	-37.81%	(218)	-87.20%
Bovine (beef) carcasses and half carcasses, nes, frozen	(70)	-24.88%	272	129.34%	(148)	-30.69%
Bovine meat and meat offal, nes, in airtight containers	(91)	-36.55%	85	53.51%	121	50.00%
Meat and edible meat offal, nes, cured including flours and meals	254	403.17%	2,438	769.09%	(2,752)	-99.90%
Veal carcasses and half carcasses, frozen	(8)	-27.32%	(6)	-26.67%	(15)	-92.48%
Meat, meat offal or blood, prepared or preserved, nes, in airtight container	(8)	-40.00%	45	375.00%	(55)	-96.49%
TOTAL	(222,068)	-36.30%	129,276	33.18%	(199,497)	-38.45%
(by number)						
Cattle embryos	(3,474)	-32.89%	2,014	28.41%	13,111	144.03%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 17: Value of Live Cattle, Beef and By-Product Exports

	PRODUCT DESCRIPTION (in '000\$)	2002	% of exports 2002	2003	% of exports 2003	2004	% of exports 2004	2005-Aug	% of exports 2005
	Live Cattle Exports	\$1,828,796	42.86%	\$591,190	25.20%	\$0	0.00%	\$99,979	19.19%
02013090	Bovine, cuts boneless-- fresh or chilled	\$1,501,558	35.19%	\$1,116,968	47.62%	\$1,698,988	76.55%	\$157,181	30.16%
02012090	Bovine, cuts with bone in, fresh or chilled	\$333,539	7.82%	\$121,455	5.18%	\$1,759	0.08%	\$3,940	0.76%
0210	Meat of Bovine animals-- salted, in brine, dried or smoked (other than cured)	\$129,932	3.05%	\$209,507	8.93%	\$208,347	9.39%	\$77,356	14.84%
02023000	Bovine, cuts boneless-- frozen	\$130,454	3.06%	\$72,654	3.10%	\$82,182	3.70%	\$58,396	11.21%
02062900	Bovine edible offal nes -- frozen	\$70,162	1.64%	\$33,154	1.41%	\$14,019	0.63%	\$14,184	2.72%
02061000	Bovine edible offal, fresh or chilled	\$55,085	1.29%	\$41,482	1.77%	\$37,860	1.71%	\$32,681	6.27%
02022000	Bovine, cuts with bone in, frozen	\$51,824	1.21%	\$23,048	0.98%	\$10,640	0.48%	\$8,207	1.57%
051110	Bovine Semen	\$45,829	1.07%	\$52,553	2.24%	\$54,198	2.44%		0.00%
05040090	Guts, Bladder and stomachs of animals (other than fish)	\$21,489	0.50%	\$12,965	0.55%	\$7,807	0.35%	\$4,447	0.85%
02011020	Veal carcasses and half carcasses, fresh or chilled	\$17,642	0.41%	\$24,799	1.06%	\$52,419	2.36%	\$42,695	8.19%
02062100	Bovine tongues, edible offal -- frozen	\$17,072	0.40%	\$8,074	0.34%	\$6,461	0.29%	\$5,110	0.98%
16025010	Bovine meat and meat offal nes, prepared meals	\$16,633	0.39%	\$5,447	0.23%	\$3,326	0.15%	\$1,644	0.32%
020890	Meat and edible meat offal nes, fresh, chilled, or frozen	\$10,629	0.25%	\$10,729	0.46%	\$11,534	0.52%		0.00%
02062200	Bovine livers, edible offal -- frozen	\$9,865	0.23%	\$6,550	0.28%	\$5,580	0.25%	\$3,084	0.59%
16025090	Meat, meat offal or blood, prepared or preserved, nes, exc in airtight container	\$6,927	0.16%	\$3,422	0.15%	\$2,323	0.10%	\$2,207	0.42%
160290	Meat, meat offal or blood of other animals nes -- prepared or preserved	\$4,729	0.11%	\$3,164	0.13%	\$2,483	0.11%		0.00%
05119940	Cattle Embryos	\$3,477	0.08%	\$3,748	0.16%	\$5,030	0.23%	\$4,177	0.80%
02102000	Bovine Meat -- cured	\$3,407	0.08%	\$3,069	0.13%	\$2,905	0.13%	\$1,880	0.36%
02011090	Bovine (beef) carcasses and half carcasses, nes, fresh or chilled	\$3,120	0.07%	\$88	0.00%	\$66	0.00%	\$282	0.05%
16025020	Bovine meat and meat offal, nes, in airtight containers	\$2,094	0.05%	\$1,020	0.04%	\$1,700	0.08%	\$2,687	0.52%
02021090	Bovine (beef) carcasses and half carcasses, nes, frozen	\$1,003	0.02%	\$343	0.01%	\$1,326	0.06%	\$977	0.19%
021099	Meat and edible meat offal nes -- cured	\$656	0.02%	\$243	0.01%	\$8,377	0.38%		0.00%
02021020	Veal carcasses and half carcasses, frozen	\$532	0.01%	\$60	0.00%	\$47	0.00%	\$1	0.00%
TOTAL		\$4,266,465	100%	\$2,345,742	100%	\$2,219,388	100%	\$521,126	100%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Continuation of Table: Value of Live Cattle, Beef and By-Product Exports

PRODUCT DESCRIPTION (in '000\$)	Difference 2003-2002 (\$1,237,605)	% change in quantity -67.67%	Difference 2004-2003 (\$591,190)	% change in quantity -100.00%	Difference 2005-2004 \$99,979	% change in quantity -	Difference 2004-2002 (\$1,828,796)	% change in quantity -100.00%	Difference 2005-2002 (\$1,728,816)	% change in quantity -94.53%
Live Cattle Exports										
Bovine, cuts boneless-- fresh or chilled	(\$384,589)	-25.61%	\$582,019	52.11%	(\$1,541,806)	-90.75%	\$197,430	13.15%	(\$1,344,376)	-89.53%
Bovine, cuts with bone in, fresh or chilled	(\$212,083)	-63.59%	(\$119,695)	-98.55%	\$2,180	123.92%	(\$331,779)	-99.47%	(\$329,598)	-98.82%
Meat of Bovine animals-- salted, in brine, dried or smoked (other than cured)	(\$1,159)	-0.55%	\$78,415	60.35%	(\$130,991)	-62.87%	\$78,415	60.35%	(\$52,575)	-40.46%
Bovine, cuts boneless-- frozen	(\$57,800)	-44.31%	\$9,527	13.11%	(\$23,785)	-28.94%	(\$48,272)	-37.00%	(\$72,058)	-55.24%
Bovine edible offal nes -- frozen	(\$37,007)	-52.75%	(\$19,135)	-57.72%	\$165	1.18%	(\$56,143)	-80.02%	(\$55,977)	-79.78%
Bovine edible offal, fresh or chilled	(\$13,603)	-24.70%	(\$3,622)	-8.73%	(\$5,178)	-13.68%	(\$17,225)	-31.27%	(\$22,404)	-40.67%
Bovine, cuts with bone in, frozen	(\$28,776)	-55.53%	(\$12,407)	-53.83%	(\$2,433)	-22.87%	(\$41,183)	-79.47%	(\$43,617)	-84.16%
Bovine Semen	\$6,723	14.67%	\$1,645	3.13%	(\$54,198)	-100.00%	\$8,369	18.26%	(\$45,829)	-100.00%
Guts, Bladder and stomachs of animals (other than fish)	(\$8,524)	-39.67%	(\$5,157)	-39.78%	(\$3,359)	-43.04%	(\$13,682)	-63.67%	(\$17,042)	-79.30%
Veal carcasses and half carcasses, fresh or chilled	\$7,156	40.56%	\$27,620	111.38%	(\$9,723)	-18.55%	\$34,776	197.12%	\$25,052	142.00%
Bovine tongues, edible offal -- frozen	(\$8,997)	-52.70%	(\$1,613)	-19.98%	(\$1,350)	-20.90%	(\$10,610)	-62.15%	(\$11,961)	-70.06%
Bovine meat and meat offal nes, prepared meals	(\$11,186)	-67.25%	(\$2,121)	-38.94%	(\$1,681)	-50.55%	(\$13,307)	-80.00%	(\$14,989)	-90.11%
Meat and edible meat offal nes, fresh, chilled, or frozen	\$100	0.94%	\$804	7.50%	(\$11,534)	-100.00%	\$905	8.52%	(\$10,629)	-100.00%
Bovine livers, edible offal -- frozen	(\$3,314)	-33.60%	(\$970)	-14.81%	(\$2,495)	-44.73%	(\$4,285)	-43.44%	(\$6,781)	-68.73%
Meat, meat offal or blood, prepared or preserved, nes, exc in airtight container	(\$3,505)	-50.60%	(\$1,098)	-32.09%	(\$116)	-5.01%	(\$4,603)	-66.46%	(\$4,720)	-68.14%
Meat, meat offal or blood of other animals nes -- prepared or preserved	(\$1,565)	-33.09%	(\$681)	-21.53%	(\$2,483)	-100.00%	(\$2,246)	-47.49%	(\$4,729)	-100.00%
Cattle Embryos	\$271	7.81%	\$1,281	34.19%	(\$853)	-16.96%	\$1,553	44.68%	\$700	20.14%
Bovine Meat -- cured	(\$338)	-9.93%	(\$164)	-5.35%	(\$1,024)	-35.26%	(\$502)	-14.75%	(\$1,527)	-44.81%
Bovine (beef) carcasses and half carcasses, nes, fresh or chilled	(\$3,031)	-97.17%	(\$21)	-24.76%	\$215	324.52%	(\$3,053)	-97.87%	(\$2,838)	-90.96%
Bovine meat and meat offal, nes, in airtight containers	(\$1,074)	-51.30%	\$680	66.73%	\$986	58.02%	(\$393)	-18.80%	\$592	28.31%
Bovine (beef) carcasses and half carcasses, nes, frozen	(\$660)	-65.79%	\$983	286.50%	(\$349)	-26.31%	\$323	32.23%	(\$25)	-2.56%
Meat and edible meat offal nes -- cured	(\$413)	-62.95%	\$8,133	3345.55%	(\$8,377)	-100.00%	\$7,720	1176.60%	(\$656)	-100.00%
Veal carcasses and half carcasses, frozen	(\$472)	-88.74%	(\$12)	-20.18%	(\$46)	-96.87%	(\$484)	-91.01%	(\$531)	-99.72%
TOTAL	(\$1,920,723)	-45.02%	(\$126,353)	-5.39%	(\$1,698,261)	-76.52%	(\$2,047,077)	-47.98%	(\$3,745,339)	-87.79%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Live cattle exports rose to nearly \$1 billion from 2004. Surprisingly, “fresh or chilled boneless cuts experienced a quantity change of -91%, or a \$1.5 billion decrease. Although it is noted that “fresh or chilled bone-in cuts”, “frozen edible offal”, “cured bovine meat”, and “fresh or chilled bovine carcasses” all had an increase in percentage of total export value between the years of 2004 and 2005, all other categories still decreased in total revenue. The total difference for these years accounts for a loss of \$1.7 billion so far in the year 2005.

Overall, from the year 2002 to 2004 being that these are two complete years for which data has been collected, there was an increase in revenue-generating exports in “fresh or chilled boneless cuts” and “salted, dried or smoked meat”. Total revenue declined 48% from 2002, from \$4.2 billion to \$2.2 billion.

A.4. Processing

During the processing stage of production, animals are handled and segregated from the rest according to the outcome of its dentition report. (MacLachlan, 2000) As exports to the United States require to be under 30 months of age. Inspecting the teeth of cattle provides an indication of age.

Prior to the cases of BSE, more of the carcass was marketable. However, with new regulations in place regarding the removal of all specified risk materials (SRMs), it has become increasingly more tedious to eliminate and dispose of the waste substance. New tools and more time are required to remove spinal and cerebral materials. Disassembling of the carcass now takes longer than the 2 hours of labor and \$54 to \$80 of wages. In addition, the animal has lost its total body-weight value, being that much of the weight is lost to SRM removal and cast away (approximately 31.1 lbs.).

A.5. Final Canadian Beef Export Consumers

Although Canada exports to numerous countries, there are four main markets: the United States, Japan, Mexico, and South Korea. All other countries have been categorized and summed under the “other” heading. In view of how the BSE incidence and post-BSE regulations have impacted the out flux of trade, points of discussion are made in reference to volumes of beef and by-product export according to price and quantity.

A.5.1. Canadian Beef Export Customers—Quantity

Quantity rankings are provided in Table 18 for each of the countries to which Canada exports its beef products. Prior to 2003, the U.S. was Canada’s largest export customer, accounting for 74% of the total export weight. This number sharply declined to 35% after discovery of BSE in Canada. Meanwhile, exports to all other countries, as a percentage of the total export weight, rose. Exports to Japan accounted for 7% more of the total exports (bringing it from 4% to 11%); Mexico, 13% (from 13% to 26%); Korea, 5% (from 3% to 8%); and all other countries, 15% (5% to 20%). After restrictions

were placed on the importing of Canadian beef commodities, countries exports were stopped from going to Japan and Korea. Over the three years, due to agreements such as NAFTA, exports from Canada to Mexico were increased by 14%. During this same time span, Japanese and Korean consumers decreased their demand for Canadian exports by almost 100% and near 36%, respectively. Trade with the United States decreased over the three years by 90% of total export weight. The total loss of mass exported was seen to decrease 72% over the three years.

A.5.2. Beef Exports by Dollar Amounts per Country and Category

In comparison to Table 18—exports by weight—it is interesting to compare value of exports as well. Table 19 provides a complete summary as to total value of exports to the countries of Japan, the United States, Mexico, and Korea. These values come from the totals provided in each of the respective countries based on Tables 20 to 23, in which the values exported from specified export categories are laid out according to each trading country from 2002 to 2004. These are ordered according to highest value of exports to least, and as can be noted, the capacity of beef and by-products exported varies from country to country.

United States

As the most prominent importer of Canadian beef and by-product, the exports to the United States totaled nearly \$3.9 billion in 2002. This decreased by 46% in 2003, and by yet another 14% in 2004, with a total decrease of 54% over the three years. However, over this time period, in respect to other countries, it can be seen that high trade was maintained in the U.S. holding 91%, 89%, and 81% of total export value from Canada for 2002, 2003, and 2004, respectively.

Exports are broken down by category in Table 20. From this, it is apparent that the 80% of export value to the United States could be attributed “live bovine, not pure-bred” (47%) and “fresh or chilled bovine cuts” (34%). In 2003, “live bovine” exports from Canada to the United States took a 68% decrease in value, later to decline to 0% of total exports in 2004, along with “live breeding bovine”. Interesting to note, however, “fresh or chilled bovine cuts” had an overall increase in export value over the year 2002 to 2004, and accounted for an increasing percentage of total export value, even though the raw value only showed an increase of \$117 million (from \$1.3 to \$1.4 billion). The other top three categories of imports by the United States in 2002 included “fresh or chilled bone-in bovine cuts” (which dropped from 8.2% to 0.05% of total exports), “meat of bovine animals – salted, dried, smoked” (which showed an increase from 3% to 11% of total export value), and “frozen boneless cuts” (increasing as a portion of total value from 1% to 3%, but overall decreasing in raw value by \$9 million).

Mexico

As the second most prominent importer of Canadian beef and by-product, exports to Mexico totaled just over \$200 million worth of beef goods in 2002. This total

Table 18: Quantity of Beef Exports from Canada to Selected Regions, in '000kgs

Country	2002	% of 2002 exports	2003	% of 2003 exports	2004	% of 2004 exports	Difference 2003-2002	% change in quantity	Difference 2004-2003	% change in quantity	Difference 2004-2002	% change in quantity
Japan	152,468	4%	81,651	11%	201	0%	(70,817)	-46.45%	(81,450)	-99.75%	(152,267)	-99.87%
United States	2,590,031	74%	265,818	35%	309,114	32%	(2,324,213)	-89.74%	43,296	16.29%	(2,280,917)	-88.07%
Mexico	464,179	13%	202,040	26%	530,987	55%	(262,139)	-56.47%	328,947	162.81%	66,808	14.39%
Korea	92,968	3%	60,967	8%	24	0%	(32,001)	-34.42%	(60,943)	-99.96%	(92,944)	-99.97%
Other	183,667	5%	154,863	20%	118,266	12%	(28,804)	-15.68%	(36,597)	-23.63%	(65,401)	-35.61%
Total	3,483,313		765,339		958,593		(27,179,74)	-78.03%	193,253	25.25%	(2,524,720)	-72.48%

Source: Statistics Canada

Table 19: Value of Beef Exports from Canada to Selected Regions, in '000\$

Country	2002	% of 2002 exports	2003	% of 2003 exports	2004	% of 2004 exports	Difference 2003-2002	% change in value	Difference 2004-2003	% change in value	Difference 2004-2002	% change in value
Japan	\$88,595	2.07%	\$56,647	2.41%	\$7,733	0%	(\$31,948)	-36.06%	(\$48,914)	-86.35%	(\$80,862)	-91.27%
United States	\$3,869,435	90.69%	\$2,077,504	88.56%	\$1,797,837	81.00%	(\$1,791,931)	-46.31%	(\$279,666)	-13.46%	(\$2,071,597)	-53.54%
Mexico	\$207,109	4.85%	\$135,763	5.78%	\$360,973	16.26%	(\$71,345)	-34.45%	\$225,209	165.88%	\$153,863	74.29%
Korea	\$51,398	1.20%	\$26,631	1.13%	\$875	0.00%	(\$24,766)	-48.19%	(\$25,755)	-96.71%	(\$50,522)	-98.30%
Other	\$49,927	1.17%	\$49,195	2.09%	\$51,968	2.34%	(\$731)	-1.47%	\$2,773	5.64%	\$2,041	4.09%
Total	\$4,266,465		\$2,345,742		\$2,219,388		(\$1,920,723)	-45.02%	(\$126,353)	-5.39%	(\$2,047,077)	-47.98%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 20: Value of Beef and By-Product Exports to the United States

HS8	HS6	PRODUCT DESCRIPTION (in '000\$)	2002	% of exports 2002	2003	% of exports 2003	2004	% of exports 2004
	010290	Bovine Live not pure-bred	\$1,811,928	46.83%	\$584,256	28.12%		0.00%
02013090	020130	Bovine, cuts boneless-- fresh or chilled	\$1,320,301	34.12%	\$1,005,252	48.39%	\$1,438,015	79.99%
02012090	020120	Bovine, cuts with bone in, fresh or chilled	\$317,622	8.21%	\$114,178	5.50%	\$989	0.06%
	0210	Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	\$118,173	3.05%	\$184,802	8.90%	\$189,755	10.55%
02023000	020230	Bovine, cuts boneless-- frozen	\$66,380	1.72%	\$44,799	2.16%	\$57,151	3.18%
05119910 05119940	051199	Other products of animal origin nes-- unfit for human consumption	\$64,656	1.67%	\$40,100	1.93%	\$38,798	2.16%
02061000	020610	Bovine edible offal, fresh or chilled	\$45,413	1.17%	\$34,310	1.65%	\$27,646	1.54%
02062900	020629	Bovine edible offal nes -- frozen	\$33,999	0.88%	\$14,316	0.69%	\$1,749	0.10%
16025010 16025020 16025090	160250	Bovine meat and meat offal (excl livers) nes -- prepared or preserved	\$24,750	0.64%	\$9,635	0.46%	\$7,332	0.41%
	051110	Bovine Semen	\$21,007	0.54%	\$17,899	0.86%	\$20,184	1.12%
05040090	050400	Guts, Bladder and stomachs of animals (other than fish)	\$12,369	0.32%	\$7,662	0.37%	\$4,835	0.27%
	010210	Bovine, live -- live purebred, breeding	\$12,358	0.32%	\$6,815	0.33%		0.00%
02089090	020890	Meat and edible meat offal nes, fresh, chilled, or frozen	\$10,278	0.27%	\$7,118	0.34%	\$8,952	0.50%
02022000	020220	Bovine, cuts with bone in, frozen	\$3,823	0.10%	\$1,100	0.05%		0.00%
02062100	020621	Bovine tongues, edible offal -- frozen	\$3,419	0.09%	\$1,883	0.09%	\$326	0.02%
02102000	021020	Bovine Meat -- cured	\$1,348	0.03%	\$1,424	0.07%	\$853	0.05%
02021020 02021090	020210	Bovine, Carcasses and half-carcasses-- frozen	\$590	0.02%		0.00%	\$47	0.00%
02109990	021099	Meat and edible meat offal nes -- cured	\$531	0.01%	\$674	0.03%	\$611	0.03%
02062200	020622	Bovine livers, edible offal -- frozen	\$481	0.01%	\$1,273	0.06%	\$589	0.03%
02011020 02011090	020110	Bovine, Carcasses and half-carcasses -- fresh or chilled		0.00%		0.00%		0.00%
16029019 16029090	160290	Meat, meat offal or blood of other animals nes -- prepared or preserved		0.00%		0.00%		0.00%
TOTAL			\$3,869,435	100.00%	\$2,077,504	100.00%	\$1,797,837	100.00%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Continuation of Table: Value of Beef and By-Product Exports to the United States

PRODUCT DESCRIPTION (in '000\$)	Difference 2003-2002	% change in value	Difference 2004-2003	% change in value	Difference 2004-2002	% change in value
Bovine Live not pure-bred	(\$1,227,671)	-67.75%	(\$584,256)	-100.00%	(\$1,811,928)	-100.00%
Bovine, cuts boneless-- fresh or chilled	(\$315,049)	-23.86%	\$432,763	43.05%	\$117,714	8.92%
Bovine, cuts with bone in, fresh or chilled	(\$203,444)	-64.05%	(\$113,189)	-99.13%	(\$316,633)	-99.69%
Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	\$66,628	56.38%	\$4,953	2.68%	\$71,581	60.57%
Bovine, cuts boneless-- frozen	(\$21,581)	-32.51%	\$12,352	27.57%	(\$9,229)	-13.90%
Other products of animal origin nes-- unfit for human consumption	(\$24,556)	-37.98%	(\$1,301)	-3.25%	(\$25,857)	-39.99%
Bovine edible offal, fresh or chilled	(\$11,102)	-24.45%	(\$6,664)	-19.42%	(\$17,767)	-39.12%
Bovine edible offal nes -- frozen	(\$19,683)	-57.89%	(\$12,566)	-87.78%	(\$32,250)	-94.85%
Bovine meat and meat offal (excl livers) nes -- prepared or preserved	(\$15,114)	-61.07%	(\$2,303)	-23.90%	(\$17,417)	-70.37%
Bovine Semen	(\$3,108)	-14.80%	\$2,284	12.77%	(\$823)	-3.92%
Guts, Bladder and stomachs of animals (other than fish)	(\$4,706)	-38.05%	(\$2,827)	-36.90%	(\$7,534)	-60.91%
Bovine, live -- live purebred, breeding	(\$5,542)	-44.85%	(\$6,815)	-100.00%	(\$12,358)	-100.00%
Meat and edible meat offal nes, fresh, chilled, or frozen	(\$3,159)	-30.74%	\$1,833	25.75%	(\$1,326)	-12.90%
Bovine, cuts with bone in, frozen	(\$2,723)	-71.22%	(\$1,100)	-100.00%	(\$3,823)	-100.00%
Bovine tongues, edible offal -- frozen	(\$1,535)	-44.91%	(\$1,557)	-82.66%	(\$3,092)	-90.45%
Bovine Meat -- cured	\$75	5.62%	(\$571)	-40.10%	(\$495)	-36.73%
Bovine, Carcasses and half-carcasses-- frozen	(\$590)	-100.00%	\$47	-	(\$543)	-92.04%
Meat and edible meat offal nes -- cured	\$142	26.84%	(\$62)	-9.34%	\$79	15.00%
Bovine livers, edible offal -- frozen	\$791	164.47%	(\$683)	-53.71%	\$107	22.43%
Bovine, Carcasses and half-carcasses -- fresh or chilled	\$0	-	\$0	-	\$0	-
Meat, meat offal or blood of other animals nes -- prepared or preserved	\$0	-	\$0	-	\$0	-
TOTAL	(\$1,791,931)	-46.31%	(\$279,666)	-13.46%	(\$2,071,597)	-53.54%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

decreased by 34% over the year 2003. However, this loss to Canada was recovered in 2004, as exports to Mexico escalated 166% between the year 2003 and 2004 (\$136 million to \$361 million). In 2004, 16% of total export value could be attributed to Mexico. Over this time period, an influx of 74%, or \$154 million, of total beef and by-product exports from Canada to Mexico, was noted.

Provided in Table 21 is a breakdown of all the values from each category which has been added to form the total sum. Unlike what the U.S. top categories of imports from Canada are, about 84% of the total value of imports is attributed to “fresh or chilled boneless cuts” (77%) and “fresh or chilled bone-in cuts” (7%). The next top three categories include “frozen boneless cuts” (5%), “frozen edible offal” (3.5%), and “fresh or chilled edible offal” (3%). Over the three years, an increase of 67% (or \$100 million) in the “fresh or chilled boneless cuts” category could be seen. Although there were a few export categories that can be seen to drop to nearly 0% of total export value, values of categories such as guts, bladder and stomachs; tongues and edible offal; salted, dried or smoked meat; semen; edible offal; and bovine carcasses increased dramatically by \$2.8 million, \$4.3 million, \$0.5 million, \$0.6 million, \$0.7 million, and \$52 million., respectively.

By comparison, exports to Mexico include a different combination of goods than the U.S. However, a great portion of the demand for “fresh or chilled boneless cuts” is made up by Mexico and the U.S. Similar to the U.S., nearly all demand for bone-in cuts in Mexico was lost, and further down the list, the demand for live cattle as well.

Japan

Accounting for 2% of total export value in both 2002, and 2003, Japan is recognized as Canada’s third largest customer of Canadian beef and by-product. Perhaps not seemingly significant, however it is notable, Exports to Japan totaled \$89 million, \$57 million, and just less than \$8 million in the respective years of 2002, 2003, and 2004, with a total net decrease in export-from-Canada value of \$81 million—91%.

Recorded in Table 22 are the individual categories that make up the total value of exports to Japan. 85% of total beef and by-product export, in this case, is composed of top four categories: “frozen boneless cuts”, “fresh or chilled boneless cuts”, “frozen tongue”, and “frozen edible offal”. To put a value to these labels, these account for \$30 million, \$20 million, \$13 million, and \$13 million, respectively, in 2002. All but the “fresh or chilled boneless cuts” presented a decrease of about 50% in 2003. In 2004, exports to Japan became minimal, with an increased demand being placed on bovine semen and products unfit for human consumption.

Korea

Referring to Table 21, total export values to Korea plummeted from \$51 million to \$0.9 million over the years of 2002 to 2004, experiencing a total decline of 98% of total Canadian export value. The only apparent categories (reported in Table 23) to be kept

Table 21: Value of Beef and By-Product Exports to Mexico

HS8	HS6	PRODUCT DESCRIPTION (in '000\$)	2002	% of exports 2002	2003	% of exports 2003	2004	% of exports 2004
02013090	020130	Bovine, cuts boneless-- fresh or chilled	\$159,604	77.06%	\$89,028	65.58%	\$266,767	73.90%
02012090	020120	Bovine, cuts with bone in, fresh or chilled	\$13,847	6.69%	\$3,951	2.91%	\$47	0.01%
02023000	020230	Bovine, cuts boneless-- frozen	\$9,961	4.81%	\$3,841	2.83%	\$9,157	2.54%
02062900	020629	Bovine edible offal nes -- frozen	\$7,258	3.50%	\$3,600	2.65%	\$7,699	2.13%
02061000	020610	Bovine edible offal, fresh or chilled	\$6,283	3.03%	\$2,230	1.64%	\$8,511	2.36%
16029019 16029090	160290	Meat, meat offal or blood of other animals nes -- prepared or preserved	\$4,667	2.25%	\$3,096	2.28%	\$2,469	0.68%
02022000	020220	Bovine, cuts with bone in, frozen	\$1,562	0.75%	\$697	0.51%	\$1,135	0.31%
05040090	050400	Guts, Bladder and stomachs of animals (other than fish)	\$1,484	0.72%	\$1,077	0.79%	\$4,326	1.20%
02062100	020621	Bovine tongues, edible offal -- frozen	\$888	0.43%	\$150	0.11%	\$5,221	1.45%
	0210	Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	\$475	0.23%	\$327	0.24%	\$991	0.27%
	051110	Bovine Semen	\$321	0.16%	\$1,572	1.16%	\$929	0.26%
	010210	Bovine, live -- live purebred, breeding	\$318	0.15%	\$322	0.24%		0.00%
16025010 16025020 16025090	160250	Bovine meat and meat offal (excl livers) nes -- prepared or preserved	\$269	0.13%		0.00%		0.00%
02062200	020622	Bovine livers, edible offal -- frozen	\$102	0.05%	\$84	0.06%	\$840	0.23%
05119910 05119940	051199	Other products of animal origin nes-- unfit for human consumption	\$40	0.02%		0.00%	\$334	0.09%
02011020 02011090	020110	Bovine, Carcasses and half-carcasses -- fresh or chilled	\$19	0.01%	\$25,644	18.89%	\$52,400	14.52%
	010290	Bovine Live not pure-bred		0.00%	\$68	0.05%		0.00%
02021020 02021090	020210	Bovine, Carcasses and half-carcasses-- frozen		0.00%	\$60	0.04%	\$102	0.03%
02089090	020890	Meat and edible meat offal nes, fresh, chilled, or frozen		0.00%		0.00%		0.00%
02102000	021020	Bovine Meat -- cured		0.00%		0.00%	\$34	0.01%
02109990	021099	Meat and edible meat offal nes -- cured		0.00%	\$6	0.00%		0.00%
TOTAL			\$207,109	100.00%	\$135,763	100.00%	\$360,973	100.00%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Continuation of Table: Value of Beef and By-Product Exports to Mexico

PRODUCT DESCRIPTION In \$	Difference 2003-2002	% change in value	Difference 2004-2003	% change in value	Difference 2004-2002	% change in value
Bovine, cuts boneless-- fresh or chilled	(\$70,575)	-44.22%	\$177,738	199.64%	\$107,163	67.14%
Bovine, cuts with bone in, fresh or chilled	(\$9,896)	-71.46%	(\$3,903)	-98.79%	(\$13,799)	-99.65%
Bovine, cuts boneless-- frozen	(\$6,119)	-61.43%	\$5,315	138.37%	(\$804)	-8.07%
Bovine edible offal nes -- frozen	(\$3,658)	-50.40%	\$4,099	113.88%	\$441	6.08%
Bovine edible offal, fresh or chilled	(\$4,052)	-64.50%	\$6,281	281.61%	\$2,228	35.48%
Meat, meat offal or blood of other animals nes -- prepared or preserved	(\$1,571)	-33.66%	(\$626)	-20.24%	(\$2,197)	-47.08%
Bovine, cuts with bone in, frozen	(\$865)	-55.36%	\$437	62.75%	(\$427)	-27.36%
Guts, Bladder and stomachs of animals (other than fish)	(\$407)	-27.42%	\$3,248	301.44%	\$2,841	191.36%
Bovine tongues, edible offal -- frozen	(\$737)	-83.01%	\$5,070	3358.32%	\$4,333	487.53%
Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	(\$147)	-31.08%	\$663	202.49%	\$516	108.47%
Bovine Semen	\$1,251	388.78%	(\$643)	-40.91%	\$607	188.81%
Bovine, live -- live purebred, breeding	\$4	1.26%	(\$322)	-100.00%	(\$318)	-100.00%
Bovine meat and meat offal (excl livers) nes -- prepared or preserved	(\$269)	-100.00%	\$0	-	(\$269)	-100.00%
Bovine livers, edible offal -- frozen	(\$18)	-17.69%	\$756	895.37%	\$737	719.34%
Other products of animal origin nes-- unfit for human consumption	(\$40)	-100.00%	\$334	-	\$293	721.60%
Bovine, Carcasses and half-carcasses -- fresh or chilled	\$25,624	128491.10%	\$26,755	104.33%	\$52,380	262653.23%
Bovine Live not pure-bred	\$68	-	(\$68)	-100.00%	\$0	-
Bovine, Carcasses and half-carcasses-- frozen	\$60	-	\$42	71.32%	\$102	-
Meat and edible meat offal nes, fresh, chilled, or frozen	\$0	-	\$0	-	\$0	-
Bovine Meat -- cured	\$0	-	\$34	-	\$34	-
Meat and edible meat offal nes -- cured	\$6	-	(\$6)	-100.00%	\$0	-
TOTAL	(\$71,345)	-34.45%	\$225,209	165.88%	\$153,863	74.29%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 22: Value of Beef and By-Product Exports to Japan

HS8	HS6	PRODUCT DESCRIPTION (in '000\$)	2002	% of exports 2002	2003	% of exports 2003	2004	% of exports 2004
02023000	020230	Bovine, cuts boneless-- frozen	\$30,017	33.88%	\$12,396	21.88%		0.00%
02013090	020130	Bovine, cuts boneless-- fresh or chilled	\$20,435	23.07%	\$19,241	33.97%		0.00%
02062100	020621	Bovine tongues, edible offal -- frozen	\$12,658	14.29%	\$5,897	10.41%		0.00%
02062900	020629	Bovine edible offal nes -- frozen	\$12,639	14.27%	\$6,114	10.79%		0.00%
	051110	Bovine Semen	\$3,587	4.05%	\$5,566	9.83%	\$6,500	84.06%
02061000	020610	Bovine edible offal, fresh or chilled	\$3,089	3.49%	\$3,602	6.36%		0.00%
05040090	050400	Guts, Bladder and stomachs of animals (other than fish)	\$2,181	2.46%	\$1,379	2.43%	\$15	0.20%
02022000	020220	Bovine, cuts with bone in, frozen	\$1,375	1.55%	\$588	1.04%		0.00%
02012090	020120	Bovine, cuts with bone in, fresh or chilled	\$843	0.95%	\$412	0.73%		0.00%
	010210	Bovine, live -- live purebred, breeding	\$601	0.68%	\$62	0.11%		0.00%
	0210	Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	\$579	0.65%	\$89	0.16%	\$14	0.18%
05119910 05119940	051199	Other products of animal origin nes-- unfit for human consumption	\$320	0.36%	\$236	0.42%	\$1,190	15.40%
02089090	020890	Meat and edible meat offal nes, fresh, chilled, or frozen	\$167	0.19%	\$1,013	1.79%	\$12	0.16%
16025010 16025020 16025090	160250	Bovine meat and meat offal (excl livers) nes -- prepared or preserved	\$72	0.08%	\$21	0.04%		0.00%
02109990	021099	Meat and edible meat offal nes -- cured	\$21	0.02%		0.00%		0.00%
02062200	020622	Bovine livers, edible offal -- frozen	\$3	0.00%	\$17	0.03%		0.00%
	010290	Bovine Live not pure-bred	\$1	0.00%		0.00%		0.00%
02011020 02011090	020110	Bovine, Carcasses and half-carcasses -- fresh or chilled		0.00%	\$3	0.01%		0.00%
02021020 02021090	020210	Bovine, Carcasses and half-carcasses-- frozen		0.00%		0.00%		0.00%
02102000	021020	Bovine Meat -- cured		0.00%	\$3	0.01%		0.00%
16029019 16029090	160290	Meat, meat offal or blood of other animals nes -- prepared or preserved		0.00%		0.00%		0.00%
TOTAL			\$88,595	100.00%	\$56,647	100.00%	\$7,733	100.00%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Continuation of Table: Value of Beef and By-Product Exports to Japan

PRODUCT DESCRIPTION (in '000\$)	Difference 2003-2002	% change in value	Difference 2004-2003	% change in value	Difference 2004-2002	% change in value
Bovine, cuts boneless-- frozen	(\$17,620)	-58.70%	(\$12,396)	-100.00%	(\$30,017)	-100.00%
Bovine, cuts boneless-- fresh or chilled	(\$1,193)	-5.84%	(\$19,241)	-100.00%	(\$20,435)	-100.00%
Bovine tongues, edible offal -- frozen	(\$6,760)	-53.41%	(\$5,897)	-100.00%	(\$12,658)	-100.00%
Bovine edible offal nes -- frozen	(\$6,524)	-51.62%	(\$6,114)	-100.00%	(\$12,639)	-100.00%
Bovine Semen	\$1,978	55.15%	\$934	16.78%	\$2,912	81.19%
Bovine edible offal, fresh or chilled	\$512	16.59%	(\$3,602)	-100.00%	(\$3,089)	-100.00%
Guts, Bladder and stomachs of animals (other than fish)	(\$802)	-36.78%	(\$1,364)	-98.90%	(\$2,166)	-99.31%
Bovine, cuts with bone in, frozen	(\$787)	-57.24%	(\$588)	-100.00%	(\$1,375)	-100.00%
Bovine, cuts with bone in, fresh or chilled	(\$430)	-51.03%	(\$412)	-100.00%	(\$843)	-100.00%
Bovine, live -- live purebred, breeding	(\$539)	-89.62%	(\$62)	-100.00%	(\$601)	-100.00%
Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	(\$489)	-84.48%	(\$75)	-84.12%	(\$564)	-97.54%
Other products of animal origin nes-- unfit for human consumption	(\$84)	-26.30%	\$954	404.01%	\$870	271.47%
Meat and edible meat offal nes, fresh, chilled, or frozen	\$845	504.10%	(\$1,000)	-98.75%	(\$155)	-92.44%
Bovine meat and meat offal (excl livers) nes -- prepared or preserved	(\$50)	-70.11%	(\$21)	-100.00%	(\$72)	-100.00%
Meat and edible meat offal nes -- cured	(\$21)	-100.00%	\$0	-	(\$21)	-100.00%
Bovine livers, edible offal -- frozen	\$14	398.49%	(\$17)	-100.00%	(\$3)	-100.00%
Bovine Live not pure-bred	(\$1)	-100.00%	\$0	-	(\$1)	-100.00%
Bovine, Carcasses and half-carcasses -- fresh or chilled	\$3	-	(\$3)	-100.00%	\$0	-
Bovine, Carcasses and half-carcasses-- frozen	\$0	-	\$0	-	\$0	-
Bovine Meat -- cured	\$3	-	(\$3)	-100.00%	\$0	-
Meat, meat offal or blood of other animals nes -- prepared or preserved	\$0	-	\$0	-	\$0	-
TOTAL	(\$31,948)	-36.06%	(\$48,914)	-86.35%	(\$80,862)	-91.27%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Table 23: Value of Beef and By-Product Exports to Korea

HS8	HS6	PRODUCT DESCRIPTION (in '000\$)	2002	% of exports 2002	2003	% of exports 2003	2004	% of exports 2004
02022000	020220	Bovine, cuts with bone in, frozen	\$29,898	58.17%	\$13,450	50.51%		0.00%
02023000	020230	Bovine, cuts boneless-- frozen	\$13,062	25.41%	\$5,153	19.35%		0.00%
02062900	020629	Bovine edible offal nes -- frozen	\$6,354	12.36%	\$2,392	8.98%		0.00%
05040090	050400	Guts, Bladder and stomachs of animals (other than fish)	\$1,090	2.12%	\$177	0.67%	\$79	9.09%
	051110	Bovine Semen	\$417	0.81%	\$288	1.08%	\$330	37.74%
02012090	020120	Bovine, cuts with bone in, fresh or chilled	\$204	0.40%	\$2,496	9.37%		0.00%
	010210	Bovine, live -- live purebred, breeding	\$198	0.39%	\$291	1.10%		0.00%
02061000	020610	Bovine edible offal, fresh or chilled	\$81	0.16%	\$52	0.20%		0.00%
02013090	020130	Bovine, cuts boneless-- fresh or chilled	\$75	0.15%	\$887	3.33%		0.00%
16025010 16025020 16025090	160250	Bovine meat and meat offal (excl livers) nes - - prepared or preserved	\$16	0.03%	\$2	0.01%		0.00%
	010290	Bovine Live not pure-bred		0.00%		0.00%		0.00%
02011020 02011090	020110	Bovine, Carcasses and half-carcasses -- fresh or chilled		0.00%	\$25	0.09%		0.00%
02021020 02021090	020210	Bovine, Carcasses and half-carcasses-- frozen		0.00%	\$25	0.10%		0.00%
02062100	020621	Bovine tongues, edible offal -- frozen		0.00%		0.00%		0.00%
02062200	020622	Bovine livers, edible offal -- frozen		0.00%		0.00%		0.00%
02089090	020890	Meat and edible meat offal nes, fresh, chilled, or frozen		0.00%	\$1,239	4.65%	\$368	42.12%
	0210	Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)		0.00%	\$44	0.17%	\$96	11.05%
02102000	021020	Bovine Meat -- cured		0.00%		0.00%		0.00%
02109990	021099	Meat and edible meat offal nes -- cured		0.00%	\$27	0.10%		0.00%
05119910 05119940	051199	Other products of animal origin nes-- unfit for human consumption		0.00%	\$77	0.29%		0.00%
16029019 16029090	160290	Meat, meat offal or blood of other animals nes -- prepared or preserved		0.00%		0.00%		0.00%
TOTAL			\$51,398	100.00%	\$26,631	100.00%	\$875	100.00%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

Continuation of Table: Value of Beef and By-Product Exports to Korea

PRODUCT DESCRIPTION (in '000\$)	Difference 2003-2002	% change in value	Difference 2004-2003	% change in value	Difference 2004-2002	% change in value
Bovine, cuts with bone in, frozen	(\$16,447)	-55.01%	(\$13,450)	-100.00%	(\$29,898)	-100.00%
Bovine, cuts boneless-- frozen	(\$7,908)	-60.54%	(\$5,153)	-100.00%	(\$13,062)	-100.00%
Bovine edible offal nes -- frozen	(\$3,961)	-62.35%	(\$2,392)	-100.00%	(\$6,354)	-100.00%
Guts, Bladder and stomachs of animals (other than fish)	(\$912)	-83.73%	(\$97)	-55.13%	(\$1,010)	-92.70%
Bovine Semen	(\$129)	-30.94%	\$42	14.57%	(\$87)	-20.87%
Bovine, cuts with bone in, fresh or chilled	\$2,292	1123.68%	(\$2,496)	-100.00%	(\$204)	-100.00%
Bovine, live -- live purebred, breeding	\$93	47.16%	(\$291)	-100.00%	(\$198)	-100.00%
Bovine edible offal, fresh or chilled	(\$29)	-35.91%	(\$52)	-100.00%	(\$81)	-100.00%
Bovine, cuts boneless-- fresh or chilled	\$811	1079.81%	(\$887)	-100.00%	(\$75)	-100.00%
Bovine meat and meat offal (excl livers) nes -- prepared or preserved	(\$14)	-86.00%	(\$2)	-100.00%	(\$16)	-100.00%
Bovine Live not pure-bred	\$0	-	\$0	-	\$0	-
Bovine, Carcasses and half-carcasses -- fresh or chilled	\$25	-	(\$25)	-100.00%	\$0	-
Bovine, Carcasses and half-carcasses-- frozen	\$25	-	(\$25)	-100.00%	\$0	-
Bovine tongues, edible offal -- frozen	\$0	-	\$0	-	\$0	-
Bovine livers, edible offal -- frozen	\$0	-	\$0	-	\$0	-
Meat and edible meat offal nes, fresh, chilled, or frozen	\$1,239	-	(\$870)	-70.24%	\$368	-
Meat of Bovine animals-- salted, in brine, dried or smoked (except cured)	\$44	-	\$52	118.84%	\$96	-
Bovine Meat -- cured	\$0	-	\$0	-	\$0	-
Meat and edible meat offal nes -- cured	\$27	-	(\$27)	-100.00%	\$0	-
Other products of animal origin nes-- unfit for human consumption	\$77	-	(\$77)	-100.00%	\$0	-
Meat, meat offal or blood of other animals nes -- prepared or preserved	\$0	-	\$0	-	\$0	-
TOTAL	(\$24,766)	-48.19%	(\$25,755)	-96.71%	(\$50,522)	-98.30%

Source: Patti Negrave, Red Meat Analyst, Animal Industry Division, Market and Industry Services Branch, Agriculture and Agri-food Canada.

as the demand from Canada for beef and by-product were guts, bladder and stomachs; bovine semen; frozen or chilled meat and edible offal; and salted, dried or smoked (except cured) bovine meat—of which the last two did not have a recorded demand for in 2002. All other demand decreased to account for nil, including the highest ranked categories of 2002—“frozen cuts with bone in”, “frozen boneless cuts”, and “frozen edible offal.”