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Agriculture and
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Agroalimentaire Canada



The Impact of Foot and Mouth Disease Outbreaks in Taiwan and South Korea on the Red Meat Industries in Canada and the United States

Economic Market Analysis Unit
July 2008

Canada

*The Impact of Foot and Mouth Disease Outbreaks
in Taiwan and South Korea on the Red Meat Industries
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Prepared by
*Pierre Charlebois
Stéphan Gagné*

For
Agriculture and Agri-Food Canada

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Project leads:

Pierre Charlebois
Stéphan Gagné

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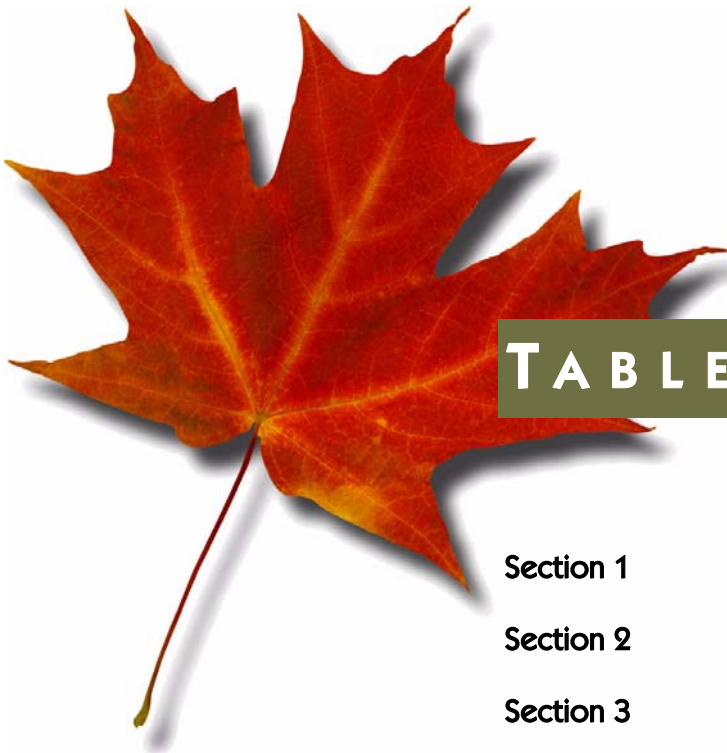


TABLE OF CONTENTS

	Summary	1
Section 1	Introduction	3
Section 2	Beef and Pork Markets	5
Section 3	Model	7
Section 4	<u>Scenario 1:</u> The Foot and Mouth Disease Epidemic in Taiwan	9
Section 5	<u>Scenario 2:</u> The Foot and Mouth Disease Epidemic in South Korea	11
Section 6	<u>Scenario 3:</u> The FMD Outbreak in Taiwan and South Korea ...	13
Section 7	Conclusion	17
	Bibliography	19
<i>Appendix</i>	Tables	21

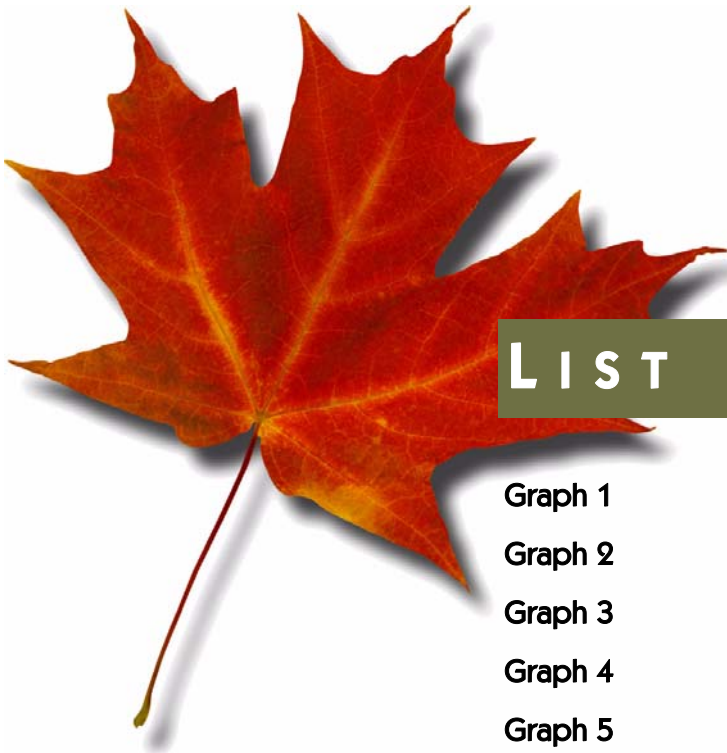




LIST OF ACRONYMS

AAFC	Agriculture and Agri-Food Canada
BSE	Bovine Spongiform Encephalopathy
DCW	Dressed Carcass Weight
FAO	Food and Agriculture Organization (United Nations)
FMD	Foot and Mouth Disease
OECD	Organisation for Economic Co-operation and Development
\$CD	Canadian dollar
\$US	American dollar





LIST OF GRAPHS

Graph 1	Taiwan Pork Exports to Japan and South Korea..	9
Graph 2	Korean Pork Exports to Japan	11
Graph 3	US Hog Price	14
Graph 4	Canadian Hog Price.....	14
Graph 5	Canadian Pork Production.....	14
Graph 6	United States – Hog/Pork Net Exports	14
Graph 7	Farm Cash Receipts – Canadian Pork Sector.....	15
Graph 8	Value of Exports and Value Added from the Canadian Reg Meat Supply Chain	15
Graph 9	Value of Pork Production in the United States	15
Graph 10	Total Gain for Canada from Foot and Mouth Disease Outbreaks in Taiwan and South Korea for the Period 1997 to 2007	15



LIST OF TABLES

Table 1	Elasticities of Long-term Supply in the Pacific Rim Countries	8
Table 2	Elasticities of Long-term Demand in the Pacific Rim Countries	8

APPENDIX A

Table A1	Scenario 3: Foot and Mouth Disease in Taiwan and South Korea – United States Pork Sector.....	21
Table A2	Scenario 3: Foot and Mouth Disease in Taiwan and South Korea – Canada Pork Sector	22
Table A3	Scenario 3: Foot and Mouth Disease in Taiwan and South Korea – Canada Red Meats	23
Table A4	Scenario 1: Foot and Mouth Disease Outbreak in Taiwan.....	24
Table A5	Scenario 2: Foot and Mouth Disease Outbreak in South Korea	25



Summary

In addition to trade liberalization, other factors have contributed to the strong growth of red meat production in Canada since the end of the 1980s. In particular, the outbreaks of foot and mouth disease (FMD) in Taiwan and in South Korea eliminated two competitors in the Japanese market.

After confirmation of the presence of foot and mouth disease in the Taiwanese swine herd, all exports of pork were suspended as of March 21, 1997. Although Taiwan accounted for only 1% of world pork production at the time, it played an important role in international pork trade with 15% of world pork exports and a large market share in Japan, the world largest importer. In 1995 and 1996, Taiwan had exported on average, approximately 380,000 tonnes (dw) of pork to Japan and Korea. In 1996, the USDA had projected that Taiwan pork exports would average 330,000 tonnes over the period from 1997 to 2007.

After 66 years of FMD free status, the disease was found in South Korea in 2000 and 2002. Pork exports to Japan were interrupted in March 2000 and have remained at very low levels since then. Korea had exported an average of 103,000 tonnes of pork (dw) annually to Japan in 1998 and 1999 and was expected to export annually an average of 93,000 tonnes between 2000 and 2007. However, analysis has shown that a share of these exports were due to Taiwan's absence from the Japanese market. Taking all of these factors into account, it can be concluded that the absence of Taiwan and Korea from the Japanese market reduced annual supply by approximately 380,000 tonne on average (2.5% of the Pacific rim market) between 2000 and 2007.

This reduction in supply caused an increase in the price of hogs in the United States and Canada of 2.5% and 3% respectively during the 1997 to 2007 period. The higher price stimulated Canadian production by an average of 5%, and by 2% in the United States. Therefore, 11% of the strong surge in Canadian pork production since 1990 can be attributed to these FMD outbreaks.

Annual agricultural farm receipts from the hog market were greater by an average of \$CD 276 million (9%) for a grand total of \$CD 3 billion over the 11 years. Moreover, the value added in the red meat processing industry was on average \$CD 158 million higher (5%) for a cumulative total of \$CD 1.7 billion. Finally, the value of exports of the red meat supply chain is on average \$CD 239 million higher (4.4%) for a grand total of \$CD 2.6 billion during these 11 years.



SECTION 1

Introduction

Many factors have contributed to the strong growth of red meat production in Canada since the late 1980s. The liberalization of markets of the Pacific Rim countries was one of the most important factors. This production growth also coincided with the elimination of the Canadian prairie grain transportation subsidy as well as the depreciation of the Canadian dollar from 1989 to 2002. As we will see, another factor that had a significant influence on the growth of the hog industry in Canada and the United States was the FMD outbreaks in Taiwan in 1997 and in South Korea in 2000 which eliminated two competitors in the Japanese pork market.

The objective of this study is to analyze the impact of these outbreaks on the red meat markets in Canada and the United States from 1997 to 2007. The first section includes a general description of the beef and pork markets followed by a description of the model used for the analysis. The subsequent sections deal with each outbreak, firstly for Taiwan followed by Korea. In each case the details of the outbreak, the development of the scenario and the results are addressed in that order. The global impact of these two epidemics is discussed in the last section.

SECTION 2

Beef and Pork Markets

One single global red meat market does not exist due to the segmentation caused by animal diseases. Instead, there are regional markets generally involving countries with the same disease status such as Pacific Rim countries which are usually free of FMD. The existence of these regional markets is demonstrated primarily by the fact that for the large majority of these countries, beef and pork trade is conducted within countries with the same animal health status. The high prices in the majority of countries that are usually free of FMD compared to other regions in the world is further proof of the existence of the Pacific Rim market. The prices in the Pacific Rim market are much higher due to the health of the herds, the quality of the meat and the purchasing power of this region of the world.

Currently, the United States, Mexico, Australia, New Zealand, Japan and South Korea are major players in this market. Most of the pork trade of the Philippines and Chile as well as Indonesia's beef trade is also conducted with the Pacific Rim OECD member countries. A portion of the European Union's pork exports are also found in this market. Before 1997 Taiwan was also part of this market since all its pork exports went to these countries (especially Japan).

In the case of Canada and the United States, it is clear that the vast majority of pork and beef is exported to these countries. Over the period from 2000 to 2006, 91 and 98% respectively of Canadian pork and beef exports, (in all forms, including live animals) were to one of these countries. For the United States, the proportions were 82 and 78% respectively for pork and beef.

The integration of these countries in the Pacific markets is not perfect. It varies from one country to the next and over time on the basis of the degree of openness, the use of safeguards, animal diseases and macro-economic crises. Nevertheless, over the years a true Pacific market for beef and pork has emerged.

SECTION 3

Model

A component of the 2007 version of the OECD-FAO AGLINK/Cosimo model is used for producing this analysis. AGLINK is a partial equilibrium dynamic model of the major international agricultural markets. The main current agricultural policies are specifically represented and world beef and pork markets are segmented according to disease status. The model includes approximately 14,000 equations and has been constructed in close cooperation with OECD members since 1989. It is used for producing OECD agricultural outlooks and as a forward looking analysis tool and does not include past market structures and agricultural policies. Consequently, it is not very well-suited to historical analysis particularly for a period greater than 10 years.

As a result, it was necessary to limit the analysis to the red meat component in the Pacific Rim market which includes the countries mentioned in the previous section with the addition of Thailand and a few Central American countries. In order to somewhat reduce the partial nature of the model, reduced form equations were introduced to capture the effect of changes to red meat production levels in the Pacific Rim market on world and national prices of feed (coarse grains, wheat and oil meals) and poultry, which acts as a substitute in the pork and beef demand functions. The coefficients in these equations were calculated using simulations done with the complete model over the forecast period.¹

Trade in AGLINK is not broken down by country of origin and destination. Simulation of bilateral trade is therefore not possible. Exports and imports are represented by variables for meat, the animals in meat equivalent and the sum of the two. The sum of exports from all the Pacific Rim countries is not always exactly equal to the sum of their imports because net trade with the rest of the world is held exogenous in this exercise.

The impact on the various countries in each scenario depends on market structure and the elasticity of demand and supply as well as the size of each market in relation to the market as a whole. As can be seen from Table 1, the United States is expected to have the greatest impact in absolute terms due to this country's share in the Pacific Rim market and due to the relatively large elasticities of supplies. Cross-elasticities of beef and pork are greater in North America than elsewhere. The importance of lamb and mutton consumption is responsible for this phenomenon in Oceania and fish and poultry play the same role in Asia.

1. *We deemed that it was preferable to have a link between the production of red meats from the Pacific and the prices of feed even if it was not based on a simulation done over the historic period.*



Table 1: Elasticities of Long-term Supply in the Pacific Rim Countries

	BEEF		PORK	
	Elasticity	Share (%) ^a	Elasticity	Share (%)
Canada	1.4	8.1	3.3	12.3
United States	1.54 ^b	59.3	1.9	51.0
Mexico	0.5	7.7	1.5	6.0
Japan	0.2	2.6	1.3	7.2
Korea	1.8	1.1	1.1	6.0
Australia	1.31	11.6	1.0	2.2
New Zealand	0.57	3.3	1.1	0.3
Thailand	0.58	1.0	1.0	3.7
Chile			1.0	2.2
Philippines			1.0	7.5
Indonesia	1.7	2.1		

a Average percentage with respect to total production or consumption in the countries included within the Pacific market over the 2000-2007 period. The figures do not add up to 100 because Central American countries do not appear in the table.

b Even though this is native production, the ability of the United States to import large quantities of cattle and calves from Canada and Mexico as feeders increases the elasticity of beef.

Table 2: Elasticities of Long-term Demand in the Pacific Rim Countries^a

	BEEF			PORK		
	Elasticity	Share (%)	Cross-Elasticity	Elasticity	Share (%)	Cross-Elasticity
Canada	-0.26	5.3	0.18	-0.16	4.7	0.16
United States	-0.25	66.2	0.06	-0.18	49.5	0.13
Mexico	-0.50	8.0	0.15	-0.20	7.4	0.15
Japan	-0.47	6.7	0.10	-0.30	13.2	0.05
Korea	-0.65	2.6	0.25	-0.37	7.3	0.20
Australia	-0.67	3.6	0.00	-0.56	2.5	0.14
New Zealand	-0.46	0.6	0.00	-0.66	0.4	0.08
Thailand	-0.90	1.2	0.06	-0.76	3.6	0.04
Chile				-0.60	1.7	0.03
Philippines				-0.81	7.6	0.04
Indonesia	-0.90	2.6	0.05			

a The elasticities of demand are in relation to producers' prices (except in Japan where wholesale prices are used).

SECTION 4

Scenario 1

THE FOOT AND MOUTH DISEASE EPIDEMIC IN TAIWAN

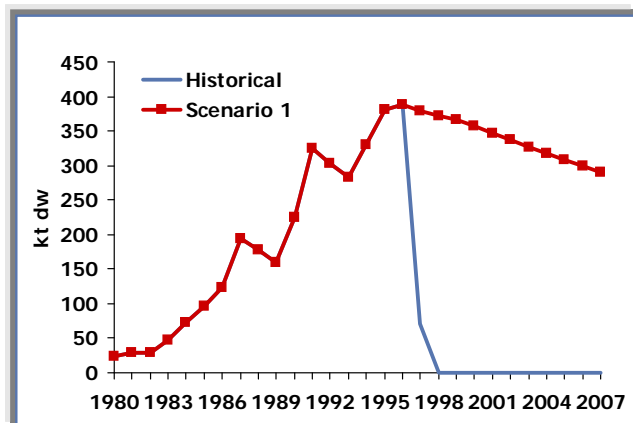
After confirmation of FMD in the Taiwanese swine herd, all exports of pork and breeding swine were suspended as of March 21, 1997. Japan, Korea and Singapore followed with an embargo on pork imports from Taiwan. This had a major impact on Taiwanese and Japanese markets as nearly 30% of Taiwan's pork production had been exported to Japan in 1996. On average, in 1995 and 1996, Taiwan had exported approximately 380,000 metric tonnes of pork (dw) Before the outbreak, Taiwan held the largest share of the Japanese pork market, over 40% in 1996. During the epidemic, Taiwan destroyed more than 3.8 million hogs and has never regained its status as a country free of the disease without vaccination. Taiwan's pork exports to Japan and Korea have remained nil to date. This allowed other exporting countries like Canada, Denmark and the United States to increase pork exports to Japan and Korea.

To analyse the impact of the FMD outbreaks in Taiwan, production and exports without the FMD outbreak had to be determined. According to the long term projections produced by the United States Department of Agriculture (USDA) in the summer of 1996, growth of pork production in Taiwan would have been restricted by environmental constraints reducing it to an annual average of only 1% between 1996 and 2005. This, together with a significant increase in demand in Taiwan due to rising incomes, would have led to a gradual reduction of exports of approximately 2.8% per year from 1997 to 2005.

Scenario 1 consists of using projections of pork exports from Taiwan produced by the USDA in the summer of 1996² for 1997 to 2005 as well as the average annual reduction over this period to estimate 2006 and 2007 (see Graph 1). This represents an average difference of 330,000 tonnes (dw) in Taiwan's pork exports to Japan and Korea compared to historic data.

In scenario 1, the price of hogs in the United States would have been 10% lower in 1997 with the absence of FMD in Taiwan. On average, between 1997 and 2007 the price of

GRAPH 1: Taiwan pork exports to Japan and South Korea



hogs in the United States and Canada would have been 2.2 and 2.6% lower, respectively. Canada's production³ would have been on average, 4.6% lower compared to 1.8% lower for the United States. Net exports⁴ would have been 9%⁵ lower in Canada and would have become negative on average in the United States.

Beef and pork being substitute products on the demand side, a drop in the price of pork leads to a drop in beef demand and price. In this scenario, the price in North America is approximately 0.25% weaker and production is slightly lower.

With regard to aggregates, annual market farm receipts from the market of Canadian hog and cattle producers would have been lower on average by \$CD 244 million (7.7%) and \$CD 33 million (0.6%), respectively, over the 1997-2007 period. The value added⁶ and value of exports⁷ in Canada would have been on average lower by \$CD 141 million (4.2%) and \$CD 212 million (3.9%) respectively for the same period. The value of American hog and cattle production would have been \$US 422 million (3.8%) and \$US 102 million (0.4%) lower on average each year.

-
2. *Because the 1996 figure in the USDA document was not final, the growth rate in the outlook was used to extrapolate the final figure of 1996.*
 3. *Unless otherwise noted, production means farm production in equivalent carcass weight.*
 4. *Unless otherwise noted, net exports means exports less imports of meat and animals in meat equivalent.*
 5. *This impact is not limited to the reduction of exports to the Japanese market but to the American market as well, which had become less lucrative due to the drop in price.*
 6. *Unless otherwise noted, this is the value added from the red meat processing sector.*
 7. *Exports of the red meat supply chain.*

SECTION 5

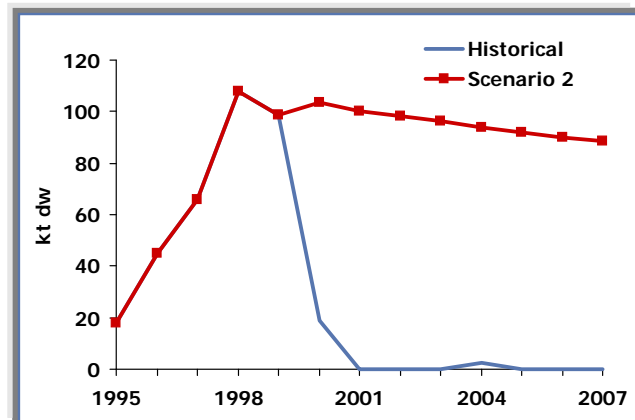
Scenario 2

THE FOOT AND MOUTH DISEASE EPIDEMIC IN SOUTH KOREA

South Korea was affected by FMD outbreaks in 2000 and 2002. Exports of pork to Japan were interrupted in March 2000 and have since remained at very low levels. In contrast to Taiwan, Korea managed to redirect a small portion of its exports to Russia and the Philippines. In 1998 and 1999, an average of approximately 92% of Korea's pork exports went to the Japanese market and 4% to the Philippines. This represented approximately 103,000 tonnes (dw) in the case of the Japanese market. The disappearance of another competitor in this market once again opened the door for Canada and the United States.

To define this scenario, Korea's exports to Japan in the absence of FMD had to be determined. World agricultural projections produced in 2000 by the Food and Agricultural Policy Research Institute (FAPRI), just before the first case in Korea, provide an FMD-free scenario covering precisely the period from 2000 to 2007. According to these projections, total exports from Korea would have increased slightly in 2000 compared to 1999⁸ but would have gradually decreased afterwards until 2009. Finally, it had to be assumed that the portion going to Japan from 2000 to 2007 would be the same as the 1998-1999 average, i.e. 92%. This represents an average difference of 93,000 tonnes (dw) in pork exports from Korea to Japan compared to historic data (see Graph 2).

GRAPH 2: Korean pork exports to Japan



Results from the analysis of this scenario show that the price of hogs in the United States would have been 3.4% lower in 2000 in the absence of FMD in Korea. On average, in the 2000-2007 period, the price of hogs in the United States and Canada would have been 0.7 and 0.85% lower, respectively. Canada's production would have been on average 1.2% lower compared to 0.44%

8. Because the 1999 figure was not final in the FAPRI document, the growth rate from the projections was used to extrapolate the final figure of 1999.

for the United States. Net exports would have been on average 2.1% lower in Canada and 19% lower in the United States.

Beef and pork being substitute products on the demand side, a drop in the price of pork leads to a drop in beef demand and price. In this scenario, the North American price is approximately 0.08% weaker and production is slightly lower.

With regard to aggregates, farm receipts from the market of Canadian hog and cattle producers would have been lower on average by \$CD 78 million (2.2%) and \$CD 11 million (0.16%) respectively, each year over the period from 2000-2007. The value added and value of exports in Canada would have been lower on average by \$CD 40 million (1.1%) and \$CD 66 million (1.1%) respectively per year. The value of American hog and cattle production would have been lower on average by \$US 134 million (1.2%) and \$US 36 million (0.11%) each year.

SECTION 6

Scenario 3

THE FMD OUTBREAK IN TAIWAN AND SOUTH KOREA

Scenario 3 is not simply the combination of the two preceding scenarios because the decline of exports from Taiwan in scenario 1 has a significant impact on pork exports from Korea from 1997 to 1999 changing its exports relative to the amount used in scenario 2. They decrease on average by approximately 40,000 tonnes (dw) per year over this period if there had been no outbreak in Taiwan. It can be thought that without FMD in Taiwan, the FAPRI projections for Korea's pork exports would have been 40,000 tonnes lower per year. This assumption is made for the period 2000 to 2007 for scenario 3.

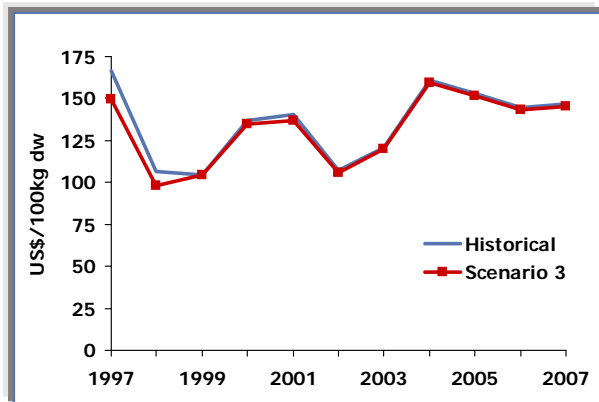
On average, over the 1997-2007 period, the price of hogs in the United States and Canada would have been 2.5 and 3% lower, respectively, in the context of this scenario (Graphs 3 and 4). Canada's production would have been on average 5% lower (Graph 5) compared to 1.9% for the United States. Since Canadian pork production in 2007 is 5% lower in this scenario, we can conclude that according to this analysis, 11% of the strong surge since 1990 was the result of FMD outbreaks in Taiwan and Korea. Net exports would have been 10% lower in Canada and would have become negative on average in the United States (Graph 6).

Because of the beef and pork substitution on the demand side, a drop in the price of pork leads to a drop in beef demand and price. In this scenario, the price of beef in North America is approximately 0.27% lower and production is slightly lower.

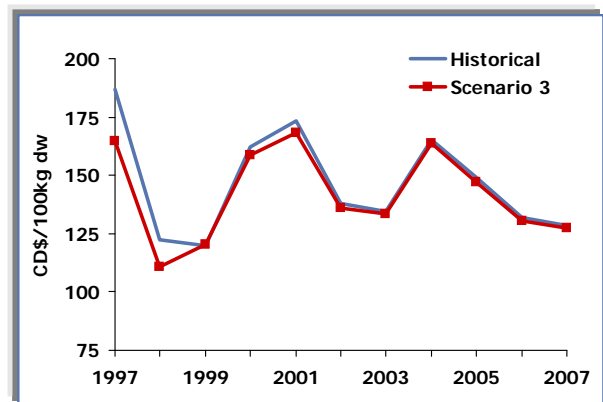
With regard to aggregates, farm receipts from the market of Canadian hog and cattle producers would have been on average \$CD 276 million (8.6%) (Graph 7) and \$CD 38 million (0.65%) lower per year over the course of the 1997-2007 period. The value added and value of Canada's exports would have been on average lower by \$CD 158 million (4.7%) and \$CD 239 million (4.4%) (Graph 8) respectively each year. The value of the American hog and cattle production would have been on average \$US 479 million (4.3%) (Graph 9) and \$US 114 million (0.41%) lower each year.

The cumulative effects over the 11 year period are considerable. The cumulative gains caused by the FMD outbreaks in Taiwan and Korea are \$CD 3 billion with regard to farm receipts in the Canadian hog sector. The total gain in value added is \$CD 1.7 billion, while the export value is \$CD 2.6 billion (Graph 10).

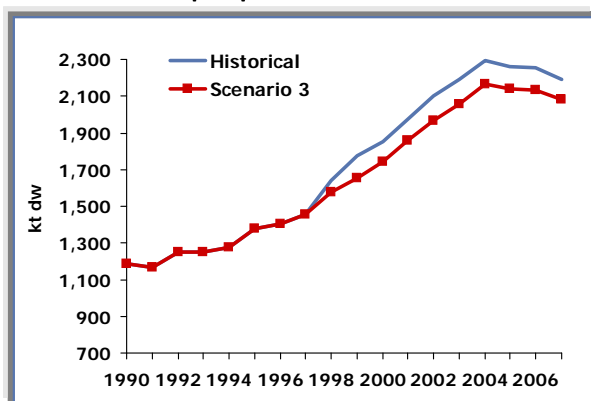
GRAPH 3: US hog price



GRAPH 4: Canadian hog price

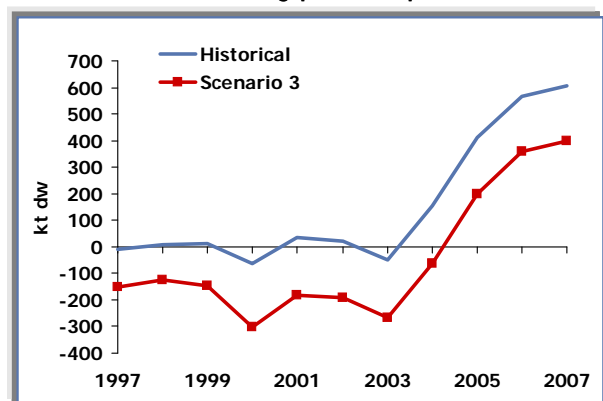


GRAPH 5: Canadian pork production*

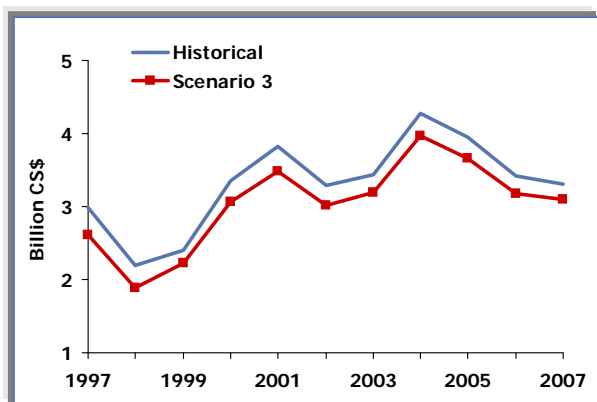


*At the farm gate in meat equivalent.

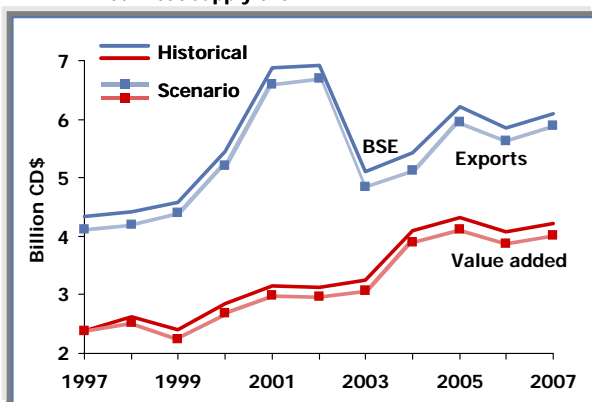
GRAPH 6: United States – hog/pork net exports



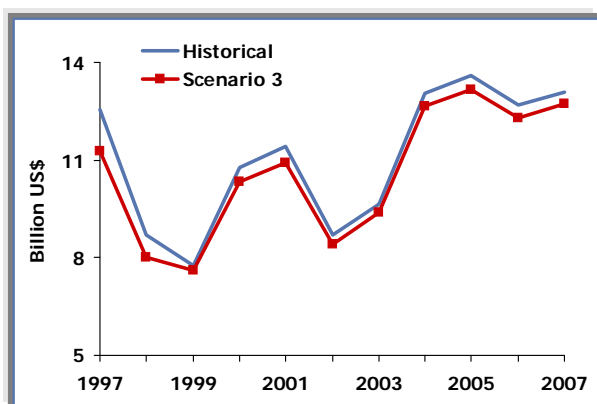
GRAPH 7: Farm cash receipts – Canadian pork sector



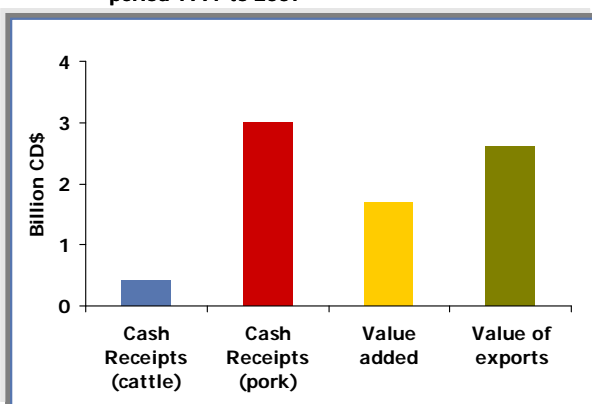
GRAPH 8: Value of exports and value added from the Canadian red meat supply chain



GRAPH 9: Value of pork production in the United States



GRAPH 10: Total gain for Canada from foot and mouth disease outbreaks in Taiwan and South Korea for the period 1997 to 2007



SECTION 7

Conclusion

The analysis shows that the outbreak in Taiwan had a greater impact than the outbreak in Korea. It demonstrates as well that the combination of these two outbreaks had a much more significant impact on the hog sector in Canada and the United States than the individual outbreaks. It also demonstrates that, to properly grasp the impact of FMD outbreaks, an analysis over a long period is preferable in order to accurately account for the gradual growth in production capacity of the exporting countries which benefited from the disappearance of competitors in the Japanese market. These results also show that 11% of the strong surge in Canada's pork production since 1990 is due to these FMD outbreaks.

The third scenario demonstrated that the two outbreaks had a significant impact on the price and production of pork in Canada. In their absence, farm receipts from the market of hog producers would have been on average lower by \$CD 276 million per year for a grand total of \$CD 3 billion over the course of these 11 years. Moreover, the value added in the red meat processing industry would also have gone down on average \$CD 158 million per year, for a total loss of \$CD 1.7 billion. Finally, the value of exports of the red meat supply chain would have gone down on average \$CD 238 millions per year for a grand total of \$CD 2.6 billion over the course of these 11 years.



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APPENDIX

Tables

Table A1: Scenario 3 – Foot and Mouth Disease in Taiwan and South Korea (United States Pork Sector)

PRICE, BARROWS AND GILTS, IOWA/MINNESOTA (US\$/100kg) dw					FARM PRODUCTION (kt)				
	HISTORICAL	SCENARIO	CHANGE	% CHANGE		HISTORICAL	SCENARIO	CHANGE	% CHANGE
1997	166.27	149.44	-16.83	-10.1%	1997	7,641	7,641	0.0	0.0%
1998	106.31	98.34	-7.97	-7.5%	1998	8,394	8,336	-58.7	-0.7%
1999	104.11	104.23	0.12	0.1%	1999	8,566	8,400	-166.2	-1.9%
2000	136.87	134.45	-2.42	-1.8%	2000	8,388	8,197	-190.9	-2.3%
2001	140.27	136.92	-3.35	-2.4%	2001	8,451	8,265	-185.9	-2.2%
2002	106.92	105.72	-1.20	-1.1%	2002	8,706	8,505	-200.3	-2.3%
2003	120.79	120.06	-0.73	-0.6%	2003	8,765	8,558	-206.9	-2.4%
2004	160.78	159.42	-1.36	-0.8%	2004	8,971	8,767	-204.3	-2.3%
2005	153.25	151.57	-1.68	-1.1%	2005	9,058	8,859	-198.3	-2.2%
2006	144.98	143.56	-1.42	-1.0%	2006	9,206	9,009	-197.0	-2.1%
2007	146.69	145.56	-1.13	-0.8%	2007	9,533	9,332	-200.8	-2.1%
Average	135.20	131.75	-3.45	-2.5%	Average	8,698.0	8,533.5	-164.5	-1.9%

NET EXPORTS (kt)					VALUE OF PRODUCTION (Bil. US\$)				
	HISTORICAL	SCENARIO	CHANGE	% CHANGE		HISTORICAL	SCENARIO	CHANGE	% CHANGE
1997	-7.8	-151.7	-143.9	1,834.6%	1997	12.6	11.3	-1.3	-10.1%
1998	9.8	-123.4	-133.2	-1,357.4%	1998	8.7	8.0	-0.7	-8.2%
1999	12.0	-148.2	-160.2	-1,337.9%	1999	7.8	7.6	-0.1	-1.8%
2000	-63.8	-302.2	-238.4	373.4%	2000	10.8	10.4	-0.4	-4.0%
2001	36.6	-181.5	-218.0	-596.2%	2001	11.4	10.9	-0.5	-4.5%
2002	22.1	-191.7	-213.8	-965.5%	2002	8.7	8.4	-0.3	-3.3%
2003	-50.0	-267.5	-217.5	434.9%	2003	9.7	9.4	-0.3	-2.9%
2004	153.7	-63.1	-216.7	-141.0%	2004	13.1	12.7	-0.4	-3.1%
2005	411.9	200.5	-211.5	-51.3%	2005	13.6	13.2	-0.4	-3.3%
2006	567.7	360.1	-207.6	-36.6%	2006	12.7	12.3	-0.4	-3.1%
2007	606.8	397.3	-209.5	-34.5%	2007	13.1	12.7	-0.4	-2.8%
Average	154.4	-42.8	-197.3	-170.7%	Average	11.1	10.6	-0.479	-4.3%

Table A2: Scenario 3 – Foot and Mouth Disease in Taiwan and South Korea (Canada Pork Sector)

PRICE, INDEX 100, ONTARIO (CD\$/100kg)					FARM PRODUCTION (kt)				
	HISTORICAL	SCENARIO	CHANGE	% CHANGE		HISTORICAL	SCENARIO	CHANGE	% CHANGE
1997	187.00	164.96	-22.0	-11.8%	1997	1,455	1,455	0.0	0.0%
1998	122.47	110.90	-11.6	-9.4%	1998	1,641	1,575	-65.8	-4.0%
1999	120.00	120.18	0.2	0.1%	1999	1,775	1,657	-117.9	-6.6%
2000	162.00	158.60	-3.4	-2.1%	2000	1,854	1,745	-108.9	-5.9%
2001	173.25	168.38	-4.9	-2.8%	2001	1,976	1,860	-116.4	-5.9%
2002	138.00	136.07	-1.9	-1.4%	2002	2,099	1,970	-129.0	-6.1%
2003	134.27	133.26	-1.0	-0.8%	2003	2,188	2,059	-129.8	-5.9%
2004	165.40	163.66	-1.7	-1.1%	2004	2,293	2,166	-127.0	-5.5%
2005	149.17	147.07	-2.1	-1.4%	2005	2,261	2,142	-119.4	-5.3%
2006	131.81	130.20	-1.6	-1.2%	2006	2,253	2,136	-116.3	-5.2%
2007	128.66	127.42	-1.2	-1.0%	2007	2,193	2,083	-109.7	-5.0%
Average	146.55	141.88	-4.7	-3.0%	Average	1,999	1,895	-103.6	-5.0%

NET EXPORTS (kt)					CASH RECEIPTS (Bil. CD\$)				
	HISTORICAL	SCENARIO	CHANGE	% CHANGE		HISTORICAL	SCENARIO	CHANGE	% CHANGE
1997	559	547	-12.2	-2.2%	1997	2.99	2.61	-0.382	-12.8%
1998	617	546	-70.9	-11.5%	1998	2.20	1.88	-0.321	-14.6%
1999	700	593	-107.1	-15.3%	1999	2.40	2.22	-0.173	-7.2%
2000	805	704	-101.3	-12.6%	2000	3.36	3.07	-0.283	-8.4%
2001	888	779	-108.8	-12.3%	2001	3.83	3.48	-0.348	-9.1%
2002	1,025	907	-118.3	-11.5%	2002	3.28	3.02	-0.265	-8.1%
2003	1,205	1,087	-117.9	-9.8%	2003	3.44	3.20	-0.247	-7.2%
2004	1,239	1,124	-115.5	-9.3%	2004	4.27	3.98	-0.295	-6.9%
2005	1,315	1,207	-108.8	-8.3%	2005	3.94	3.67	-0.278	-7.0%
2006	1,315	1,209	-105.8	-8.0%	2006	3.41	3.18	-0.232	-6.8%
2007	1,259	1,159	-99.6	-7.9%	2007	3.31	3.10	-0.211	-6.4%
Average	993	897	-96.9	-9.9%	Average	3.31	3.04	-0.276	-8.6%

Table A3: Scenario 3 – Foot and Mouth Disease in Taiwan and South Korea (Canada Red Meats)

VALUE OF EXPORTS (Bil. CD\$)					VALUE ADDED (Bil. CD\$)				
	HISTORICAL	SCENARIO	CHANGE	% CHANGE		HISTORICAL	SCENARIO	CHANGE	% CHANGE
1997	4.33	4.12	-0.216	-5.0%	1997	2.38	2.38	-0.002	-0.1%
1998	4.42	4.20	-0.223	-5.0%	1998	2.63	2.52	-0.103	-3.9%
1999	4.57	4.40	-0.176	-3.8%	1999	2.40	2.25	-0.150	-6.2%
2000	5.45	5.20	-0.254	-4.7%	2000	2.85	2.69	-0.154	-5.4%
2001	6.87	6.59	-0.284	-4.1%	2001	3.15	2.98	-0.171	-5.4%
2002	6.92	6.70	-0.221	-3.2%	2002	3.14	2.96	-0.175	-5.6%
2003	5.11	4.85	-0.258	-5.1%	2003	3.25	3.07	-0.186	-5.7%
2004	5.42	5.12	-0.304	-5.6%	2004	4.09	3.89	-0.197	-4.8%
2005	6.21	5.95	-0.269	-4.3%	2005	4.32	4.12	-0.201	-4.6%
2006	5.86	5.63	-0.222	-3.8%	2006	4.08	3.88	-0.196	-4.8%
2007	6.08	5.88	-0.203	-3.3%	2007	4.22	4.02	-0.206	-4.9%
Average	5.57	5.33	-0.239	-4.4%	Average	3.32	3.16	-0.158	-4.7%

Table A4: Scenario 1 – Foot and Mouth Disease Outbreak in Taiwan

UNITED STATES	AVERAGE (1997-2007)		MAXIMAL IMPACT	
	Change	%	Change	%
PORK				
Price (US\$/100 kg)	-3.02	-2.20	-16.82	-10.11
Disappearance (kt)	28.74	0.35	124.60	1.63
Net exports (kt)	-176.00	-162.64	-205.60	-322.00
Value of production (bil. US\$)	-0.422	-3.82	-1.27	-10.11
BEEF				
Price (US\$/100 kg)	-0.56	-0.23	-5.24	-2.22
Farm Production (kt)	-14.92	-0.13	-30.00	-0.26
Net exports (kt)	-2.86	-0.21	-6.20	-0.47
Value of production (bil. US\$)	-0.102	-0.37	-0.562	-2.25
CANADA	AVERAGE (1997-2007)		MAXIMAL IMPACT	
	Change	%	Change	%
PORK				
Price (CD\$/100 kg)	-4.08	-2.62	-22.04	-11.78
Disappearance (kt)	3.20	0.40	12.15	1.60
Net exports (kt)	-87.00	-9.00	-107.10	-15.30
Cash receipts (bil. CD\$)	-244.20	-7.71	-381.50	-14.60
BEEF				
Price (CD\$/100 kg)	-0.83	-0.27	-8.49	-2.62
Farm Production (kt)	-4.44	-0.29	-12.10	-0.80
Net exports (kt)	-0.27	-0.10	-9.76	-2.08
Cash receipts (bil. CD\$)	-33.30	-0.60	-148.40	-2.81
RED MEATS (BIL. CD\$)				
Value added	-0.141	-4.23	-0.178	-6.22
Value of exports	-0.212	-3.90	-0.264	-5.04

Table A5: Scenario 2 – Foot and Mouth Disease Outbreak in South Korea

UNITED STATES	AVERAGE (2000-2007)		MAXIMAL IMPACT	
	Change	%	Change	%
PORK				
Price (US\$/100 kg)	-1.0	-0.7	-4.6	-3.4
Farm Production (kt)	-39.5	-0.44	-52.02	-0.60
Net exports (kt)	-49.2	-19.0	-57.8	-115.6
Value of production (bil. US\$)	-0.134	-1.2	-0.362	-3.4
BEEF				
Price (US\$/100 kg)	-0.2	-0.1	-1.7	-0.7
Farm Production (kt)	-3.6	-0.03	-7.0	-0.06
Net exports (kt)	0.5	0.08	3.0	0.1
Value of production (bil. US\$)	-0.04	-0.11	-0.2	-0.69
CANADA	AVERAGE (2000-2007)		MAXIMAL IMPACT	
	Change	%	Change	%
PORK				
Price (CD\$/100 kg)	-1.4	-0.85	-6.5	-4.0
Farm Production (kt)	-25.3	-1.2	-35.6	-1.7
Net exports (kt)	-23.9	-2.1	-31.7	-3.1
Farm cash receipts (bil. CD\$)	-0.078	-2.15	-0.144	-4.30
BEEF				
Price (CD\$/100 kg)	-0.3	-0.1	-3.0	-0.8
Farm Production (kt)	-1.3	-0.1	-3.7	-0.2
Net exports (kt)	0.1	0.04	4.9	1.1
Farm cash receipts (bil. CD\$)	-0.011	-0.16	-0.057	-0.83
RED MEATS (BIL. CD\$)				
Value added	-0.040	-1.09	-0.051	-1.63
Value of exports	-0.066	-1.10	-0.094	-1.56

