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Mad Cow Disease and the Value of a Hog in Canada*

Brenda Dyack
Research Assistant, University of Guelph

and

Karl D. Meilke
Professor, Department of Agricultural Economics and Business
Co-Director, Canadian Agri-Food Trade Research Network
University of Guelph

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Author contact information:

Karl Meilke
Department of Agricultural Economics and Business
University of Guelph
Guelph, Ontario
Canada
N1G 2W1

Phone: 519-824-4120 ext. 2769
Fax: 519-767-1510
E-mail: Meilke@agec.uoguelph.ca
Web page: www.uoguelph.ca/kmeilke

Brenda Dyack
Senior Economist
Ministry of Finance
Economic Development, Resources and Non-Tax Revenue
Toronto, Ontario
Canada

Phone: 416-327-2106
E-mail: Brenda.dyack@fin.gov.on.ca

1.0 Introduction

There is no Mad Cow Disease (Bovine Spongiform Encephalopathy or, BSE) in Canada and BSE has not been found in hogs anywhere, and yet regulations affecting all Canadian livestock are influenced by the outbreak of this disease.[1] Regulations affect:

- What all livestock are fed, and
- How by-products of all meat production are valued and used.

The goal of this paper is to evaluate the likelihood of regulatory changes that may influence the profitability of hog/pork production.[2] To do this the following topics are reviewed.

- The known facts about BSE.
- The regulatory situation that has evolved because of BSE - how we got to where we are with regard to BSE.
- The possible regulatory changes.
- The impact of regulatory changes on the processing of meat by-products and on feed production and its use.
- The impact of potential regulatory changes on the value of market hogs in Canada.

2.0 Scientific Evidence Concerning BSE

Over 99 per cent of all cases of BSE have occurred in the UK and only in cattle. The incidence of BSE is falling in the UK and elsewhere in the EU. At the peak of the epidemic in 1992, 36,000 cases of BSE were reported in Great Britain compared with 1,348 in 2000. BSE has not occurred outside the EU. Up to February 2001, and since BSE was first diagnosed in the UK in 1986, there have been 180,903 BSE cases reported in the UK and 1,924 elsewhere in the EU. There were 99 confirmed or suspected cases in the EU in February 2001 – 1 in Ireland, 3 in France and the rest in the UK.

[1] This paper reflects information available at the time of writing, June 2001. A list of sources is given at the end of this paper. Specific references are numbered and shown in brackets.

Part of the controversy surrounding current or new regulations regarding BSE is related to the fact that scientists do not fully understand the disease, and therefore it is not obvious what regulations are required to control its spread. Scientists are not sure how BSE started in the UK or how it spread. It is suspected that BSE in cattle has crossed over to humans but even this is not known for sure. There are theories about how BSE occurred but no complete scientific explanation. BSE is a chronic degenerative disease affecting the central nervous system of cattle. It is classified as a Transmissible Spongiform Encephalopathy (TSE) and there is no cure. The incubation period is from two to twelve or more years. Once it occurs, death follows in two weeks to twelve months.

Most scientists now believe that BSE occurred spontaneously as a mutation in the brain of a cow, or in cattle in the UK, in the mid-1980s or perhaps as early as the 1970s [1, 19]. It is commonly thought that BSE was spread by feeding processed remains of sick animals to healthy animals that contracted the disease from the feed. The animal parts that are believed to have contained the diseased material are the Specified Risk Materials (SRMs). SRMs include the brain, part of the intestinal tract, spinal column, bone marrow and other offal materials.

There are other TSEs in other mammals. Humans can suffer from Fatal Familial Insomnia, Cerstmann-Straussler-Scheinker Syndrome and Creutzfeldt-Jakob Disease (CJD). NvCJD (nv for “new variant”, or simply, “variant” - vCJD) is the related human disease that is theorized to have been caused by humans eating bovine material contaminated with BSE. In 1996, researchers announced that nvCJD and BSE are of the same “strain”, and consuming BSE diseased material from beef may cause nvCJD in humans. In the 1980s it was believed that Scrapie (another TSE) in sheep was the cause of BSE and that cattle got the disease from eating diseased sheep remains. This theory has since been discounted. Scrapie is present in Europe, Canada and the U.S. but not in all countries – Australia deems itself free of scrapie. Deer and elk in Canada suffer from Chronic Wasting Disease, cats get a form of TSE and other animals have been infected experimentally by injecting diseased material into their brains. There is a

[2] The general background on BSE is based on information available at a large number of web sites in the United States, European Union and the United Kingdom. Some of the web sites are provided in the reference list.

report that pigs have been infected with BSE, but only by diseased cells being injected directly into the brain.

If nvCJD is caused by BSE it represents a case of the disease crossing species through eating diseased material. This has not been proven but there is evidence that TSEs can cross species through feed. There is a report that minks have become infected by eating diseased ruminant feed.

There are other theories about how BSE occurred and spread. One is that all TSEs are mutations that are either inherited (a weakness is inherited), passed through the placenta and/or caused by a common environmental condition. The most common theory is that the disease is characterized by abnormal prions in the brain. Prions are proteins that seem to bind to foreign substances in the brain such as copper. Abnormal prions bind to healthy brain cells or proteins and destroy them. The destroyed portions leave gaps as in a sponge hence the name – spongiform. It has been suggested that excessive amounts of copper in the environment have led to the mutation of healthy prions. The mutation made the affected prions attack healthy brain material.

Animals with BSE cannot be diagnosed with the disease until they die and their brain tissue is tested. There are symptoms of BSE such as disorientation, nervousness, aggression, decreasing milk production, loss of body weight with maintained appetite and falling, but confirmation of the disease requires testing after death. Recent random testing in the EU has uncovered the fact that seemingly healthy cattle can also be infected.

In summary, scientists cannot confirm what the disease is and how it spreads. Rendering does not kill the diseased material. It may not be possible to totally inactivate diseased material except in autoclaves and even then if the material re-enters the food chain, the exact outcome is unknown. The result has been the creation of regulations that are designed to protect consumers and livestock under this uncertainty. In addition, changes in regulations are being driven by emerging scientific information, but all under a cloud of uncertainty. The current trend, with the EU ban on feeding any Meat and Bone Meal (MBM) to farmed animals, is towards a policy of zero risk as far as is humanly possible. This is a response to consumer safety concerns and real concerns about consumer confidence in eating meat. Negative consumer response to the 1996

announcement in Britain about the possible link between BSE and CJD was swift, and led the government and industry to adopt a conservative approach to the protection of the food chain.

3.0 Current Policy Towards BSE: European Union

Current EU policy is that until December 2001 there is a temporary ban on the feeding of all MBM to all farmed animals [2]. A six-month ban was in effect until June 30, 2001 due to the inability of member states to ensure that ruminant by-products such as MBM did not contaminate other animal by-products. This resulted from the failure to enforce the regulations against the co-mingling of ruminant and non-ruminant materials. The ban has now been extended for a further six months. At the moment there are huge stockpiles of processed animal waste products in the EU. None of this material can be used or exported. Sixteen million tonnes of animal by-products are produced in the EU annually and two million tonnes of this are not fit for human consumption, under any circumstances, because it comes from fallen stock. Some of the fallen stock might carry BSE. There are reports that potentially BSE-contaminated material is now being mixed with clean material.

Officials in the EU have stated that rendering and animal feed production practices in Denmark, the Netherlands and Ireland completely avoid the risk of cross-contamination of feed material through the dedication of facilities to ruminant or non-ruminant materials. However, these three EU members are still bound by the general EU regulations concerning the ban on feeding animal by-products.

When and if the feeding ban is lifted, there have been other recent changes to permanent policy [3]. These include:

- Additional risk materials have been banned from processing for feed and fats – spinal column and associated dorsal root ganglia, for example.
- Rendered fats are considered to be free of BSE but rules have been imposed to require that material from fallen stock and SRMs are not contained in EU fats. On June 19, 2001, it was decided by the EU Agriculture Council that these regulations should also apply to imports from countries even if they do not have BSE. North

American rendering plants are not designed to remove SRMs and they have included fallen stock in processing.[3] According to Neville Chandler of the National Renderers' Association, "up to 70,000 tonnes of yellow grease is imported into Europe each year from North America and, without substantial change in the method of manufacture by North American plants, this amount of fat will have to be found from other sources. Thus, the feed industry will compete for fats with the pharmaceutical and cosmetic industry, driving up the price of the raw material [4]." Rothsay has reported to us that it is planning to stop taking fallen stock and drug residue hogs as of August 1, 2001 [11].

- There is now a ban on the use of mechanically recovered meat derived from the bones of cattle, sheep and goats in feed and food.
- All animals over 30 months of age destined for human consumption must be tested for BSE.

The following list provides a brief chronology of developments with respect to BSE in the EU.

1990 - UK Chief Medical Officer states beef is safe to eat.

1993 - UK Chief Medical Officer reiterates that beef is safe to eat.

1994 - BSE is shown to be orally transmissible in cattle.

1994 - An EU-wide ban on feeding of mammalian meat and bone meal to ruminants (cattle, sheep and goats).

1995/96 - First death of a person with nvCJD.

1996 - Officials in the EU and UK announce that there is a probable link between BSE and nvCJD.

[3] Policies concerning fallen stock are changing rapidly.

2000 - As of May 1, there is a requirement to remove specified risk materials (e.g. spinal cord, brain, eyes, tonsils, parts of the intestines) from cattle, sheep and goats throughout the EU. These materials are removed from the animal and human food chains.

2001 – two consecutive bans on the feeding of all animal proteins to farmed animals. The ban will be re-evaluated before it expires in December 2001.

2001 – Removal of Specified Risk Materials (SRMs) will become mandatory for imports of meat and meat products (especially tallow, gelatin, and pet food) from third countries except for Argentina, Australia, Botswana, Brazil, Chile, Namibia, Nicaragua, Norway, New Zealand, Paraguay, Singapore, Swaziland and Uruguay from 1 October, 2001, although dates for implementation often change. Canada is not included among the exempted countries because it has a slightly higher risk assessment (Geographical Risk Assessment) because it imported cattle from the UK after BSE existed there and those animals may have carried BSE. The imported animals cannot be fully traced [3, 5].

3.1 United States and Canada

Current Canadian policy is characterized by the following restrictions.

- No feeding of rendered ruminant (cow, goat, sheep) protein to ruminants.
- No feeding of mammalian protein to ruminants with some exclusions. The exclusions include porcine meal, equine protein, milk and blood proteins from all species. As a result, proteins from animals other than ruminants such as mink, cats and dogs, etc, are prohibited from use in ruminant feed.
- No restriction on feeding any rendered protein to non-ruminants.

Canada has no regulations that require renderers to remove SRMs during the rendering process. Due to the close trading association between the U.S. and Canada, the policies in the two countries following the BSE outbreak in the UK have been similar. In 1997, ruminant MBM was banned from ruminant feed while much earlier, in 1989, imports of live animals or by-products from countries with BSE were banned [6, 7].

3.2 New Zealand and Australia

The policy towards BSE in New Zealand and Australia is similar to North America except that their ban on live animal imports from the UK started a year earlier in 1988. And similarly, in 1997, ruminant MBM was banned from ruminant feed. In 1999 Australia banned feeding of Specified Mammalian Material to ruminants [8, 9].

4.0 Potential Policy and Regulatory Responses

There is the potential for further policy change outside the EU regarding BSE. According to the Canadian Food Inspection Agency (CFIA), and the U.S. government, there is a minimal risk of BSE becoming a problem in Canada or the United States. This is because of the precautions (i.e. the so-called “firewalls”) that have been adopted in each country to prevent BSE from entering. A risk assessment, commissioned by the U.S. Department of Agriculture, is currently underway at Harvard University and it will evaluate the existing regulatory framework to determine if it is adequate. No further policy changes are likely until the Harvard study is released.

The policy changes in the EU suggest consumers are best protected with a ban on feeding MBM. Consequently, there is the potential for consumers outside the EU to believe that they are not as well protected from BSE, if there is no ban on MBM, in their own countries. Some officials believe that the EU is unlikely to reverse its position. If this happens there may be increased pressure to extend the feeding ban to other countries, and there appears to be pressure from consumer awareness groups to do this. Articles in daily newspapers inform consumers of current regulations and practices and draw conclusions about the potential for BSE spreading to Canada. Typically there is an emotional slant to the articles that could sway public support in favour of a ban. Although based on facts, the articles can interpret the facts in different ways. For example, there was an accidental mix-up in a large United States feed manufacturing facility earlier this year. As a result, a herd of cattle in Texas was fed some feed that contained ruminant material that should not have been fed to ruminants according to current policy. The amount was small, but even if it were enough to infect an animal, there is no BSE confirmed at this time in the United States. The controls were effective

in identifying the problem and the herd was purchased by the feed manufacturer and destroyed, thus eliminating any possibility of spreading BSE even though BSE is not believed to be present in North America. However, some critics have pointed to this, not as a success of the current program, but as evidence that controls do not work. This particular feed manufacturer is no longer using ruminant by-products in any feed. For them, this policy effectively removes consumer doubt about their products.

Events in the EU have the potential to encourage other countries to make changes to their own regulations that would influence the profitability of many industries. This paper is focused on how potential changes might affect the hog/pork industry. The potential policy changes include:

1. Maintain the status quo (no feeding of mammalian-derived protein to ruminants, with some exclusions as noted above), otherwise no restrictions;

2. No specie to same specie feeding of rendered protein;

3. No feeding of ruminant protein to pigs but feeding of pig protein to ruminants is allowed;

4. No rendered protein to be fed to food-producing animals - where the food is for humans;

5. No rendered protein to be fed to animals including pets;

6. Allow feeding of rendered protein that can be certified as meeting the “Category 3” requirements of the European Union (including the absence of Specified Risk Material and dead stock.).

Policy changes such as these would have an impact on producer profits through the cost of feed, and the value of by-products produced from livestock. The goal of this analysis is to provide a preliminary estimate of the impact of feed cost increases and the

potential loss of by-product revenues on the profitability of raising hogs. What follows in section 5 is a description of rendering and feed production that provides the background for the analysis in section 6.

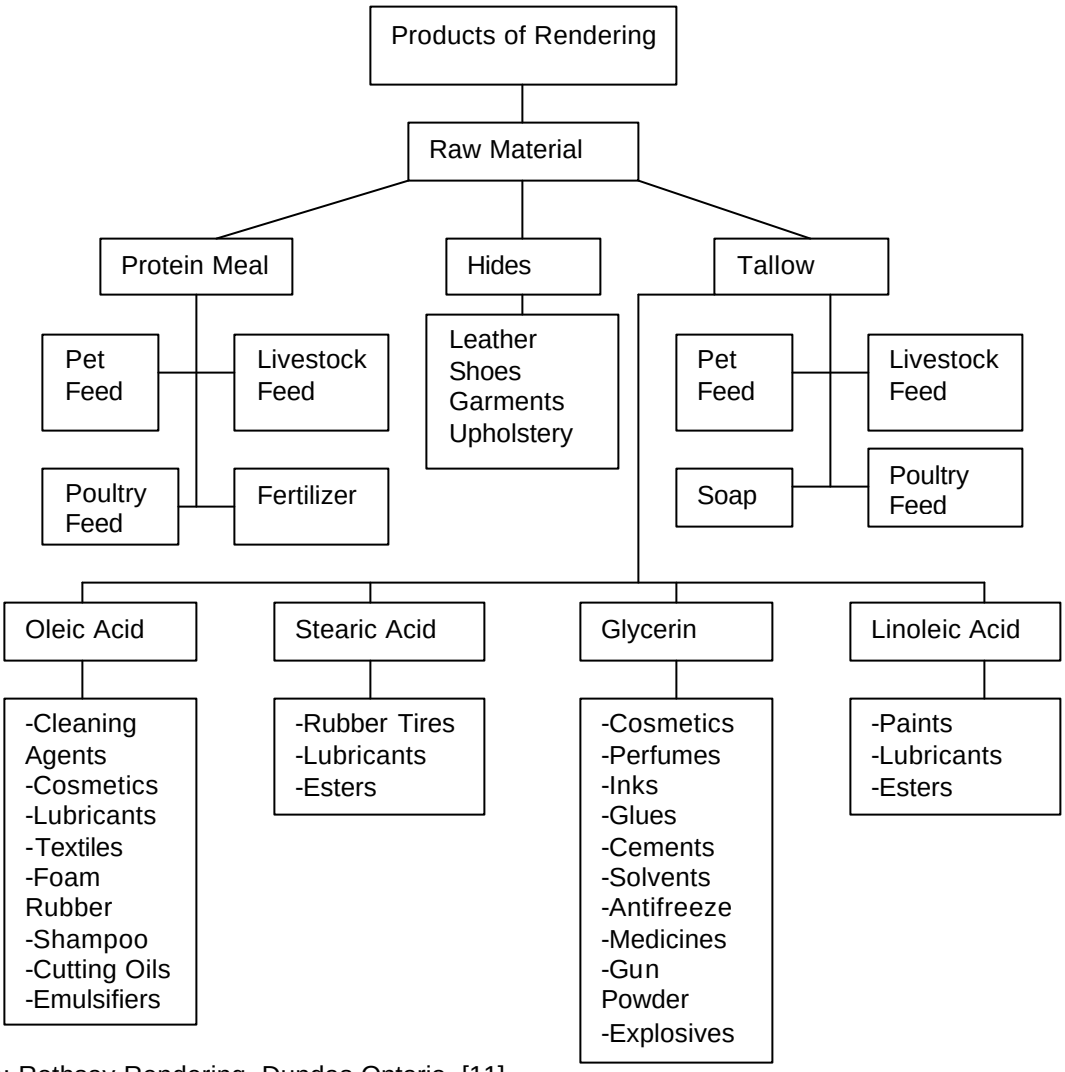
5.0 The Impact of Potential Regulatory Changes on Rendering and Feed Production

Meat packers depend on renderers to process their animal waste. Pork processors sell by-products and animal waste, and the revenue contributes to the value of pork production and ultimately to the value of live swine. With changes in the use of MBM and fats from rendering, the value of pork by-products will be affected. Rendering is described below with the goal of identifying the potential changes that could have an impact on the pork industry. Potential changes in feed costs are also described.

5.1 Animal By-Products

Animal by-products are the output of rendering. In the past, meat packers sold the waste from meat processing to renderers. According to renderers, this practice is in transition with the price of animal protein declining relative to soybean meal to such an extent that there may soon be a charge associated with the pick-up and rendering of waste products. Figure 1, illustrates the movement of MBM prices relative to soybean meal. The changes have been due to a number of factors that go beyond the framework of this study. However, one factor is the decline in the use of MBM that contains ruminant material both here and in the EU. The early premium that MBM received relative to soybean meal is gone and now MBM tracks soybean prices quite closely. Very recent price changes suggest soybean meal now has a price premium over MBM. Prices reported by Agriculture Canada for Winnipeg for June 18, 2001, are $300.50 for soybean meal and $280.00 for MBM (CDN$/tonne) [10]. Pork MBM is not reported in the Agriculture Canada report but pork MBM, since it can be used in feeding ruminants, carries a price premium over soybean meal and MBM, and this is indicated in Figure 1.

The following flow chart shows how raw materials move through a rendering plant.



Source: Rothsay Rendering, Dundas Ontario [11]

5.2 Facts About Rendering

There are 3 major renderers with 26 plants in Canada, and a total of about 35 renderers in the industry. In the U.S. there are 260 renderers of which 165 are independent and 95 are in-house at meat processors. About 30,000 tonnes per week of animal wastes/by–products are processed by renderers in Canada [11]. Less than ten percent of waste products collected for rendering comes from dead stock. The vast majority of a renderer's animal waste comes from meat packers.

In general, for hogs:

- 60 percent of the animal goes into meat production; and
- 40 percent of the animal is not fit for human consumption – approximately 1.7 million tonnes per year.
- The waste portion is made into blood meal, MBM, lard and choice white grease.
    - 56 percent of the waste is water that needs to be driven off.
    - 50 percent of remaining waste is rendered into fats and fatty acids, which account for about two-thirds of a rendering plant's total revenue.
    - 50 percent of the remaining waste is made into protein meals.
        - ✓ 90 percent of MBM is used in livestock and poultry feed.
        - ✓ 10 percent of MBM is used in pet food.
        - ✓ less than 0.5 percent of MBM is used for fertilizer.

Last year, Canadian renderers paid $30-$50 per tonne for animal waste and they predict that this price will drop to near zero this year.[4] It is possible that renderers will begin charging meat packers to pick up waste material. Trucking waste costs approximately $30/tonne.

The European standard for rendering is 133 degrees at 3 bars of pressure for 20 minutes – the Canadian system is a vacuum system so it cannot be compared to the EU standard but it is believed to match the purification standards of the European regulation. BSE and sulfa-based antibiotics are not destroyed by rendering but other pathogens are destroyed.

In Europe, to prevent cross contamination, separate rendering operations are used and separate feed mills are used when MBM is incorporated into rations. Anecdotal evidence suggests that UK renderers have never been more profitable than they are now, when they are disposing of a high-risk product.

5.3 The UK Experience

The economic impacts on meat packers of removing meat waste from the feed chain are caused by meat processors having no, or only limited, markets for their waste products. If meat processors have no market for their waste products and if charges are imposed, some or all of this negative economic impact will be shifted back to hog producers. It is useful to review what happened in the EU in order to predict the magnitude of changes that might occur in Canada in response to potential changes in feed regulations. Three estimates of the cost of BSE regulations are summarized below.

For about two years, the government in the UK provided subsidies to renderers so that meat processors would not have to pay waste disposal charges when the ban on feeding ruminants meat and bone meal was put in place. Specifically, government support was provided to UK renderers in 1996/97 and 1997/98 to maintain prices for animal waste collected from meat processors. Renderers were given a subsidy of £97 million for the first twelve months and were required to keep prices of animal waste purchases constant over the period 1996/97 (i.e., after BSE was linked to CJD in England). In 1997/98, the UK government support was reduced to £59 million and the industry knew that financial support would end by the end of that year. Prices were not controlled but allowed to be phased into market prices. In 1996-1997, red meat production was about 2 million tonnes and therefore, the subsidy amounted to about £5 per pig [13]. This is one estimate of the cost per pig of the BSE regulations. A second estimate is provided below.

Analysis done by agricultural economist, John Strak, in the UK suggests that there is an implicit “BSE Tax” on the pork industry in the UK recently valued at about

[4] The value of animal waste will move up and down with the price of animal protein feed, oils and other by-product prices.

£5.26 per pig [14]. This tax is the estimated amount by which the pork industry suffers as a result of the extra costs imposed by regulations designed to protect consumers from BSE. It is also the approximate value, per pig produced, of the rendering subsidy provided between 1996 and 1998. Given that swine do not suffer from BSE, it is considered by some to be an unfair cost imposed on the industry without compensation. Sheep and beef producers have received various forms of compensation in the past using the argument that they are hurt by the BSE crisis.

A third estimate of the cost of BSE regulations is provided by a EU study, which refers to the use of processed animal proteins in animal feed [15]. This study provides two important cost estimates.

- The total revenue from the sale of by-products by the rendering industry is estimated in the order of 1.5 bn Euros. This figure represents the value of waste plus the value added by the rendering industry.
- In the case of a total ban on the use of MBM, the loss in revenue from the rendering industry plus the cost of disposal of animal waste is estimated at 3 bn Euros. In other words, the total cost of rendering and waste disposal is estimated to be equal to twice the revenues prior to the ban. [5]

These three ways of looking at the cost of BSE regulations and feeding bans are used below in the analysis of the impact of potential changes in regulations in Canada.

5.4 Feed Costs

Feed costs represent about two-thirds of the total cost of raising swine for sale and this is generally true worldwide. Swine feeds are blended to be nutritionally the same for each product, although protein sources vary widely for the same ration depending on input costs. Removal of MBM in Western Canada would have a smaller impact than its removal in the East because relatively less MBM is used in the feed

[5] The wording in the original EU document is somewhat ambiguous. Their estimates may be interpreted to be higher than twice the value. It may be that the total cost of rendering and waste disposal in the case of a ban is equal to 4.5 bn Euros which is three times the value of by-product sales before a ban. We chose to provide a conservative interpretation of the total cost partly due to the ambiguity in wording of the EU report and partly since there is no BSE in Canada and therefore the disposal treatment of MBM could be less extensive and less costly.

formulations in the West. If the MBM price declines relative to the soybean meal price, the relative cost of substituting soybean meal for MBM will increase over time.

MBM is an important source of minerals and amino acids necessary for swine and other animal diets. MBM now represents 5-6 percent of hog feed by weight. Replacement with grain and legume sources of protein requires the addition of some amino acids and minerals, especially phosphorus. Least cost feed models are used to determine the lowest cost ration that meets all nutritional needs. Feed manufacturers do not share these models although there may be some models available publicly. The National Renderer's Association is currently estimating the cost of removing MBM from feed.

The current cost of swine feed is $200-$210 per tonne while the current price of pork MBM is $211.70US/tonne, in the United States, which is approximately equal to $324.53CDN/tonne. Removing rendered products from swine feed increases estimated average cost by $2–$12 per tonne (1 percent at best and 6 percent at worst) depending on target protein and energy levels. Since swine consume 7-9 different rations depending on age, with lower protein levels as they age, the impact of changing protein prices has a different impact depending on the feed type. The $2–$12 per tonne cost estimate includes the cost of increasing phosphorus supplement that MBM automatically supplies besides protein. Phosphorus is fairly expensive to add to the diet [12].[6]

These estimates are consistent with a French study by ACTA/ANDA which estimated that removing all MBM would raise feed costs by about one percent, and confirms a personal communication with a feed manufacturer who said 1-3 percent [16]. Feed manufacturers are becoming increasingly wary of using MBM and this attitude is developing to some extent for all MBM across feed producers.

All of the feed cost estimates assume no subsequent change in feed ingredient prices. Essentially, they represent the cost of reformulating swine rations to replace meat and bone meal with other ingredient prices remaining unchanged. This is a reasonable assumption for an individual feed mill, or perhaps even a country that uses a

[6] The assumption made for this study is that there has not as yet been a significant substitution away from MBM in hog feed for food safety reasons.

small amount of meat and bone meal in its rations. However, in North America, meat and bone meal accounts for between five and ten percent of the high protein ingredients used in animal feed. If there were a complete ban on the use of meat and bone meal it would reduce the available supply of high protein feeds and increase the price of ingredients (i.e. soybean meal) significantly. Depending on market conditions and the time allowed for supplies to adjust, the increase in high protein ingredient costs could range between ten and forty percent in the short to medium term. This potentially large effect on the swine sector is ignored in the remainder of our analysis.

5.5 Meat Processors

Meat processors would lose their market for animal waste with some of the potential regulatory changes. This decline in their processing margin would put downward pressure on what they could pay swine producers. It is not clear what the sharing of costs would be among swine producers, meat packers and renderers if there were a regulatory change. For illustrative purposes, it is assumed that all changes affect the value of a hog at the production level. In reality, other levels of the supply chain would also bear some of the costs, including final consumers of pork products

6.0 The Cost of a Regulatory Change

The potential policy changes with respect to the use of meat and bone meal are:

1. Maintain the status quo (no feeding of mammalian-derived protein to ruminants with the exclusions noted above); otherwise no restrictions.

2. No specie to same specie feeding of rendered protein.

3. No feeding of ruminant protein to pigs but feeding of pig protein to ruminants is allowed.

4. No rendered protein to be fed to food-producing animals - where the food is for humans.

5. No rendered protein to be fed to animals including pets.

6. Allow feeding of rendered protein that can be certified as meeting the “Category 3” requirements of the European Union (including absence of specified risk material and dead stock).

1. The status quo is beneficial to the pork industry in the sense that pure pork MBM is a preferred product to MBM that contains ruminant material. Pork MBM can be used in any livestock feed while MBM containing ruminant material cannot be fed to ruminants. The price premium this gives to pork MBM is shown in Figure 1. This is a relatively valuable processed pork by-product currently available for feeding. The potential policy changes would affect the value of meat and bone meal and consequently, the value of live swine. The simulations shown in Table 1 represent changes from the status quo. The feed cost changes discussed above are one aspect. Implications of the other policy changes are discussed and the impact on costs of the extreme cases are given below.

2. Currently, ruminant MBM cannot be fed to ruminants. The price premium for pork MBM illustrates the impact of this regulation. The impact of the second policy (no specie to same specie feeding of rendered protein) would cause part of the price premium for pork MBM to be eliminated. This would follow from a ban on feeding porcine MBM to hogs. Hogs would have to be fed MBM from fish, poultry or ruminants. Such a policy would require separation by specie during rendering since ruminant MBM is currently produced along with other waste products. Canada does not have dedicated facilities and flushing is very expensive between runs of different types of waste.

3. Pigs are currently fed any MBM from ruminants, poultry, pork, fish or a mixture of sources. If ruminant MBM is no longer fed to pigs this raises the relative value of pork MBM above the status quo. However, there is the possibility that feed costs could rise without ruminant MBM going to pigs.

4. The fourth potential policy is the current EU policy with a ban on feeding all MBM with the exception of pets. Pet food represents a destination for only ten percent of MBM and therefore the impact would be similar to the next scenario but to a slightly lesser extent.

5. The fifth potential policy (no rendered protein to be fed to animals including pets) represents the most extreme case where feed costs rise when MBM is eliminated in all feed formulations, and revenues fall with the entire market for animal by-products eliminated. Added to this are the costs of by-product disposal. Disposal by landfill is not an option, thus by-products would need to be rendered, as they are in the EU, before disposal. Both rendering and eventual disposal through incineration or other means represent significant costs.

6. The separation of all materials and rendering at dedicated plants by specie is not possible in Canada given the large capital costs of rendering. This option is listed but the costs would need to be investigated further.

In summary, there is one extreme potential policy, and that is the elimination of all MBM from all livestock and pet feed. All other cases would be less costly to the pork industry and the third option could lead to greater profits. For illustrative purposes, some estimates of the cost of the extreme case are provided below. First, the feed cost implications are estimated and second, the impact of a loss of by-product markets is examined.

6.1 Feed Cost Impacts

Table 1 illustrates a range of possible impacts on swine producers of a total ban on the use of MBM in feed.[7] The cost and revenue figures are from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Swine Enterprise Budget for 2000

[7] This assumes the ban has no effect on other feed ingredient prices.

[17]. There are many other possible cases, but a few are shown here to illustrate the impact of feed cost increases of the magnitudes outlined above.

6.1.1 The Current Situation

The first row of Table 1 shows the current situation.

- Farrow-to-finish feed costs of $75.47/hog, total variable costs of $116.55/hog and total costs of $140.49/hog.
- Feed costs are 65 percent of variable costs and 53 percent of total costs according to the methodology used by OMAFRA.
- With total revenue of $160.19 per market hog, including revenue from culling, the net return of $19.70 is 12.3 percent of total revenue.

6.1.2 Potential Feed Cost Increases

- With a one percent increase in feed costs, feed costs are $76.22/hog, total variable costs are $117.30/hog, and total costs are $141.24/hog.
- Feed costs are 65 percent of total variable costs, 54 percent of total costs and the profit margin falls to 11.8 percent which represents a 4 percent decline in the profit margin in comparison to the status quo.
- With a three percent increase in feed costs, feed costs are $77.73/hog, total variable costs are $118.81/hog, and total costs are $142.75/hog
- Feed costs are 66 percent of total variable costs, 55 percent of total costs and the profit margin falls to 10.9 percent which represents a 12 percent decline in the profit margin.
- Similarly, a six percent increase in feed costs would reduce the profit margin to 9.5 percent from the current situation of 12.3 percent, for a 23 percent decline in the profit margin.

In Summary:

- A 1 percent feed cost increase leads to a 4 percent decline in the profit margin per hog.

- A 3 percent feed cost increase leads to a 12 percent decline in the profit margin per hog.
- A 6 percent feed cost increase leads to a 23 percent decline in the profit margin per hog.

These estimates are made assuming no change in hog prices or cull revenues. This is not reasonable because margin changes of the size estimated would affect the supply of hogs and cause an increase in the price of live animals. The hog price increase would result in a "sharing" of the feed cost increase.

These estimates provide an estimate of the loss in profits from feed cost changes, but feed cost increases are only one aspect of the cost of removing MBM and other protein products from the food chain. The other "cost" is the loss in revenue from the sale of animal waste for use in by-product production. A further cost is the cost of disposing of rendered animal by-products if they have no commercial value. These costs are evaluated in the next section.

6.2 By-Product Impacts

In the extreme case of a ban on all MBM used in animal feed, meat packers are left with animal waste to dispose of, and this waste will have to be rendered. Waste will need to be rendered because dumping it in a landfill is not a long-run solution for the huge amounts of raw waste produced. Assuming that renderers are making a normal return, given current payments for animal waste and current output prices for their products such as MBM, rendering charges for disposal purposes will need to match the current value of by-products in order for renderers to provide the rendering service.

Four ways of estimating the cost of disposal of animal waste are given below.

- The first is a simple calculation of the loss in revenue to meat packers if MBM is not used in feed.
- The second uses an estimate of the value of all by-products in the final market and counts this as a loss in value to pig production. This is similar to the support provided to the UK rendering industry in 1996-97 as was discussed above.

- The third uses the approach taken by the EU in estimating the cost of disposal of all MBM.
- The fourth uses the BSE tax approach discussed above.

6.2.1 No Sales of Animal Waste

The simplest cost estimate follows from the following logic. In the past year renderers in Canada paid approximately $50/tonne for animal waste. The loss in revenue per hog can be calculated in the following way, assuming the value of animal waste falls to zero.

Forty per cent of a hog is waste going to renderers. For a typical 245 lb. hog, this represents 98 lbs. Hence, one tonne of waste is generated by processing 22.5 hogs. If $50/tonne is paid for waste, the amount attributable to each hog is approximately $2.22. This would be the loss in revenue if animal waste has no value.

The drawback of this simple method is that it assumes there are no related costs that affect meat packers and waste disposal is free. In addition, if wastes must still be processed then there would be trucking (at approximately $30/tonne) and rendering costs that would have to be covered as well as the cost of final disposal of rendered output. This method does not deal with these cost items. The remaining three methods represent an attempt to address these other costs that result from a loss in commercial markets and the disposal of rendered products.

6.2.2 By-Product Valuation

Table 2 and Figures 2 and 3, illustrate the information that goes into valuing the by-products associated with the processing and rendering a hog.[8] Figure 2 shows the current by-product prices with meat processing by-products given first, left to right, and the by-products resulting from rendering given next. Rendered by-product prices are lower. Both types of by-product are shown from the least valuable to the most valuable per hundredweight. Figure 3 and Table 2 illustrate how these by-products contribute to the value of a hog. Table 2 shows the amount of by-product in each live animal and the

[8] These values are available at the USDA web site www.ams.usda.gov/mnreports/nw_ls446.txt [18]. For this report, similar values are assumed for Canada.

final value of each hog when the technical factors are applied to current market prices of by-products.

Table 2 shows the estimates for hogs, in Canada, based on the U.S. Department of Agriculture methodology for calculating the value of pork by-products. These include offal meats, pet food inputs, MBM, Blood Meal and Lard. Not all by-products are shown in the USDA source document but these by-products represent most of the value.[9] In total, 16.84 pounds of by-products are produced from 100 pounds of hog, generating approximately $10.40 per animal in revenues for meat producers and renderers, in Canada, using current values (Table 2). The value of MBM from one hog is $1.62/hog. If all offal and by-products have no value, the loss is the full $10.40/hog. If choice white grease and lard maintain markets, the loss in value is $7.80/hog. The value of rendered products is $4.57/hog of which $1.98/hog consists of protein products.

6.2.3 The EU Approach to Disposal Costs

The estimates provided above do not include the cost of disposing of animal by-products if they have no commercial value. The EU has estimated that the cost of disposing of animal by-products is equal to their current market value. This was discussed in section 5.3. Based on the estimated value of by-products alone (Table 1), for just the MBM, the loss in revenue plus the cost of disposal amounts to approximately $3.24/hog, i.e. twice the value of $1.62/hog. If all protein products are no longer used in feed, the loss in revenue and disposal would be twice $1.98/hog or $3.96/hog. If all by-products must be disposed of, the loss of revenue and disposal costs are estimated at $20.80/hog. For all by-products except choice white grease and lard, the loss in value is $7.80/hog and disposal costs add another $7.80/hog, resulting in a loss of $15.60/hog.

6.2.4 BSE Tax Approach to the Cost of Losing By-Product Markets

[9] USDA figures are used for meat processing by-products. USDA rendering factors were different from the rendering information provided by Rothsay Inc. We use the USDA figures for meat by-products, and the factors provided by Rothsay for the rendered by-products. If this report is followed by an in-depth study, Canadian by-product factors and values could be used.

In the UK the “BSE Tax” is the term used to refer to the extra costs of production caused by the regulations intended to reduce the risk of spreading BSE. If, as assumed in Table 1 this cost is $5.00 per pig, which is one-half of the estimate in the UK, and feed costs increase one percent, then a BSE tax of $5.00 per pig results in a 29 percent loss in profit margin. Given that Canada does not have BSE, it is assumed the costs of disposing of animal waste would be significantly less here, but the figure of 50 percent less is entirely arbitrary. If feed costs rise six percent then this scenario would lead to a 49 percent loss in profit margin from the current situation (Table 1).

The UK subsidies make up the bulk of what has been estimated to be the BSE Tax in the UK and therefore, this amount is unlikely to mean much in the Canadian context. For our purposes, the costs of losing by-product markets and disposing of by-products, discussed in section 6.2.2, are more relevant for the estimates of the cost of regulatory change in Canada due to BSE

The example of a complete ban and a total loss of commercial markets represents the worst-case scenario and provides only an illustration of potential effects. For example, there may still be some markets for the offal or fats and fatty acids from rendering which would reduce disposal costs. In addition, it was assumed that the hog producer would bear the full cost of the disposal of by-products, however there would be some sharing of the cost of disposal with others in the supply chain. All of the estimates used data for 2000, and hog prices are higher now, although the five-year average price is about the same as in 2000.

7.0 Conclusions

The main reasons for the MBM feeding ban in the EU is the inability of renderers and feed manufacturers to keep MBM from ruminants separate from other animal MBM. The feeding ban is a response to the failure of EU regulations to restrict ruminant MBM use. Since there is no BSE in Canada there is no scientific basis for Canada to follow the EU policy, however, Canada may adopt more stringent regulations for the use of MBM regardless. This might happen if the United States decides to follow the EU policy, or if third party import policies restrict trade in MBM unless Canada follows suit.

Some believe it is unlikely that the EU will be able to go back to a less restrictive ruminant ban now that a total ban has been in place.

The cost estimates of a feeding ban provided in this paper are based on the extreme situation where Canada adopts the same animal feed policies as the EU. Although this seems an extreme policy response, the Canadian Food Inspection Agency is currently considering numerous options and a feeding ban is among them. Also, if the U.S. were to adopt a feeding ban, Canada would likely follow with similar policy changes. Perhaps more pertinent, is the possibility that feed manufactures and pig producers may choose to stop feeding MBM as a voluntary measure. This paper illustrates that this option could have costly implications if all producers choose the same option. Not only would feed costs rise, at least some of the by-products of meat production would require costly disposal measures. Our estimates suggest that costs would rise by at least $4.71 per hog if only rendered proteins were no longer used and feed costs rise by only one percent (2X$1.98=$3.96 in lost by-product value and disposal costs, and $0.75 in increased feed costs). In the extreme, if all animal by-products were eliminated from human and pet food chains, and disposal costs are equal the value of output, the total cost of a feed ban could equal as much as $25.33/hog (2X$10.40=$20.80 in lost by-product value and disposal costs and $4.53 in increased feed costs). (Table 2)

These estimates are made under the assumption that there are no alternative uses for animal waste material. This may not be the case, since animal by-products can be used in bio-diesel and there is research into the use of MBM in fertilizers that are more versatile than powdered MBM. These estimates are also made using disposal cost data from the EU. Since there is no BSE in Canada, disposal may be less than 50 percent of the estimated disposal costs in the EU. In summary, the estimates provided here are based on incomplete information but they do indicate the nature of the losses that could affect hog producers.

8.0 References

Information was generously provided during discussions with a number of people and groups, as indicated in this section. The authors appreciate the input provided by many individuals, however, errors and omissions are the responsibility of the authors.

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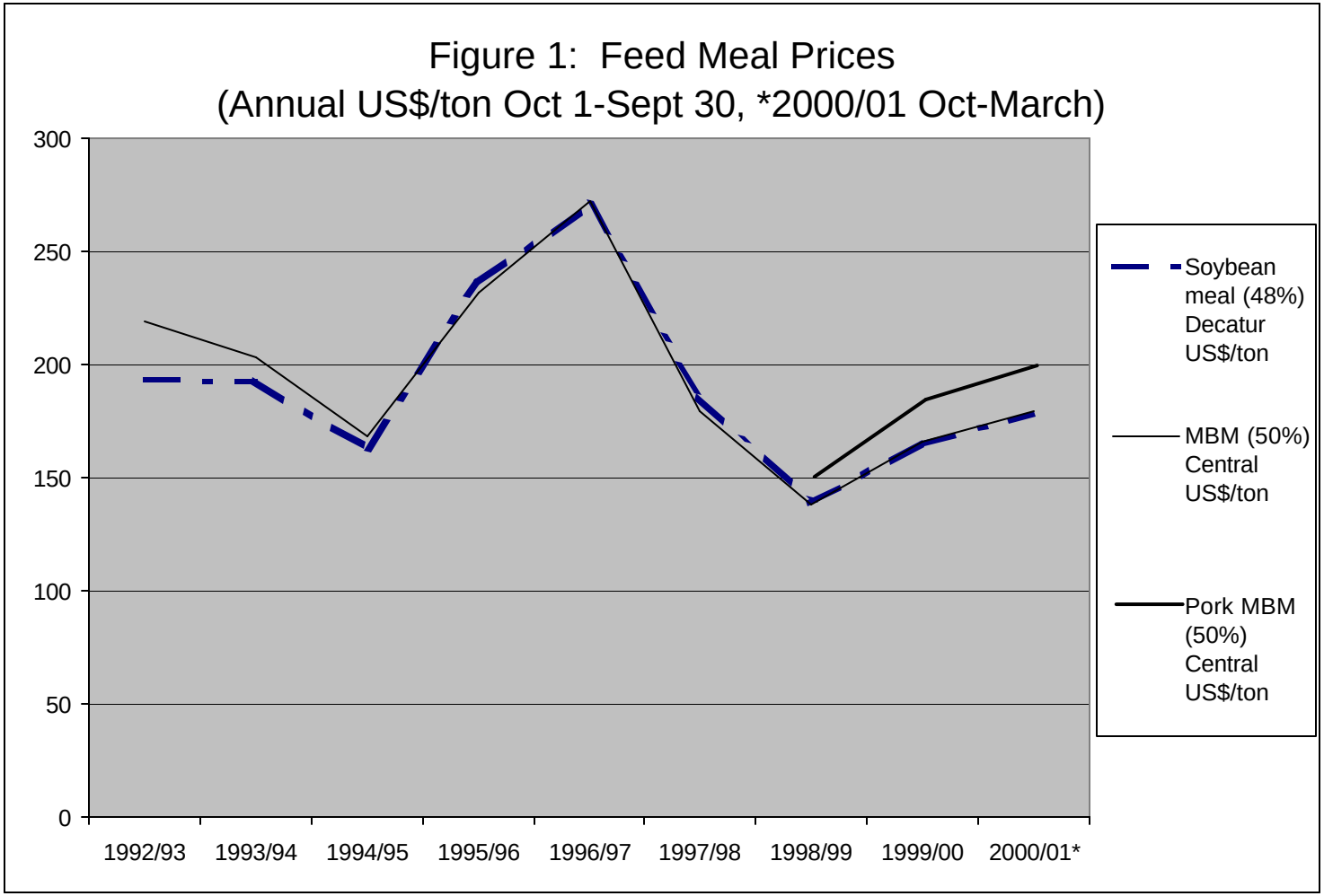

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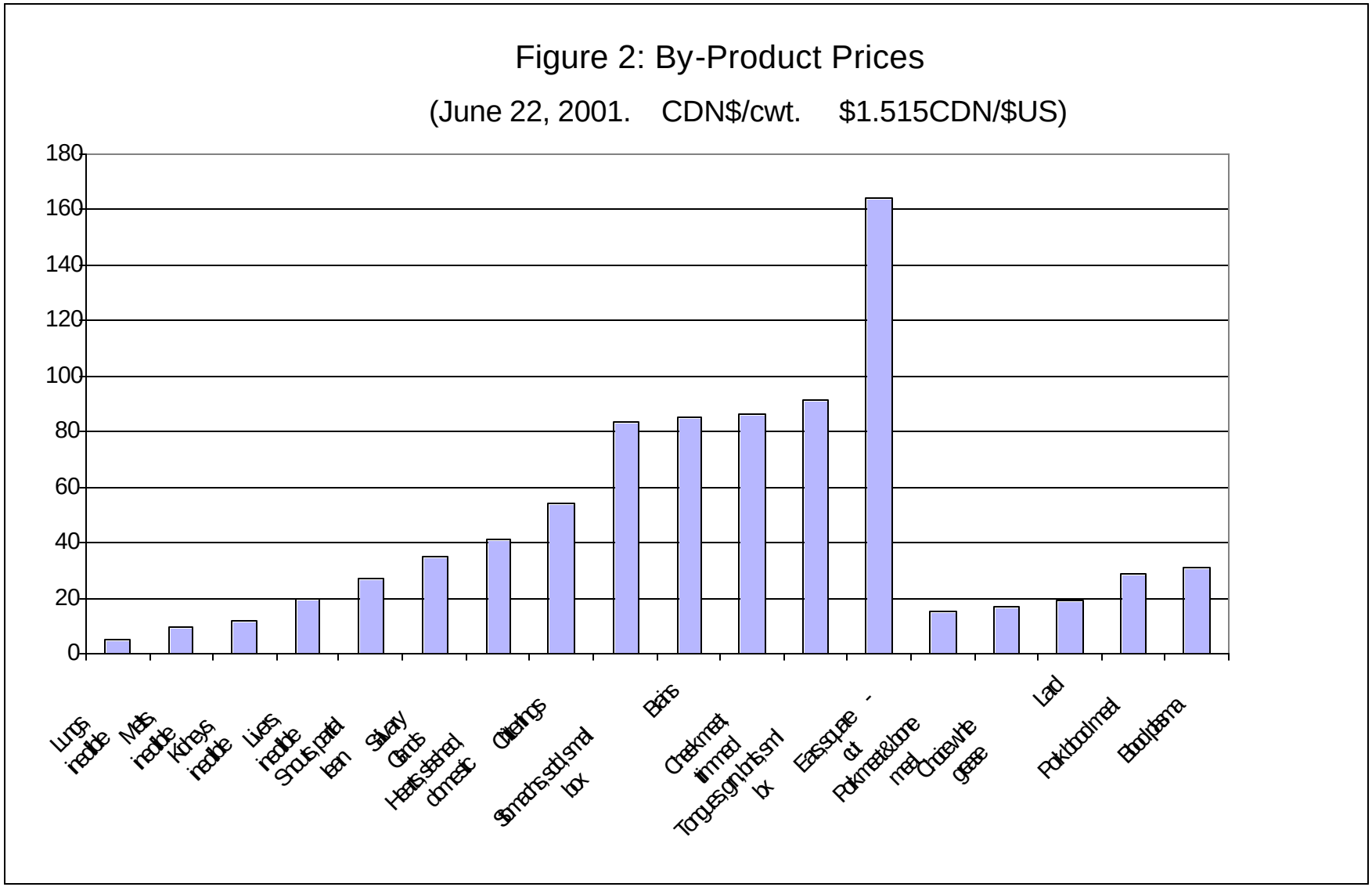

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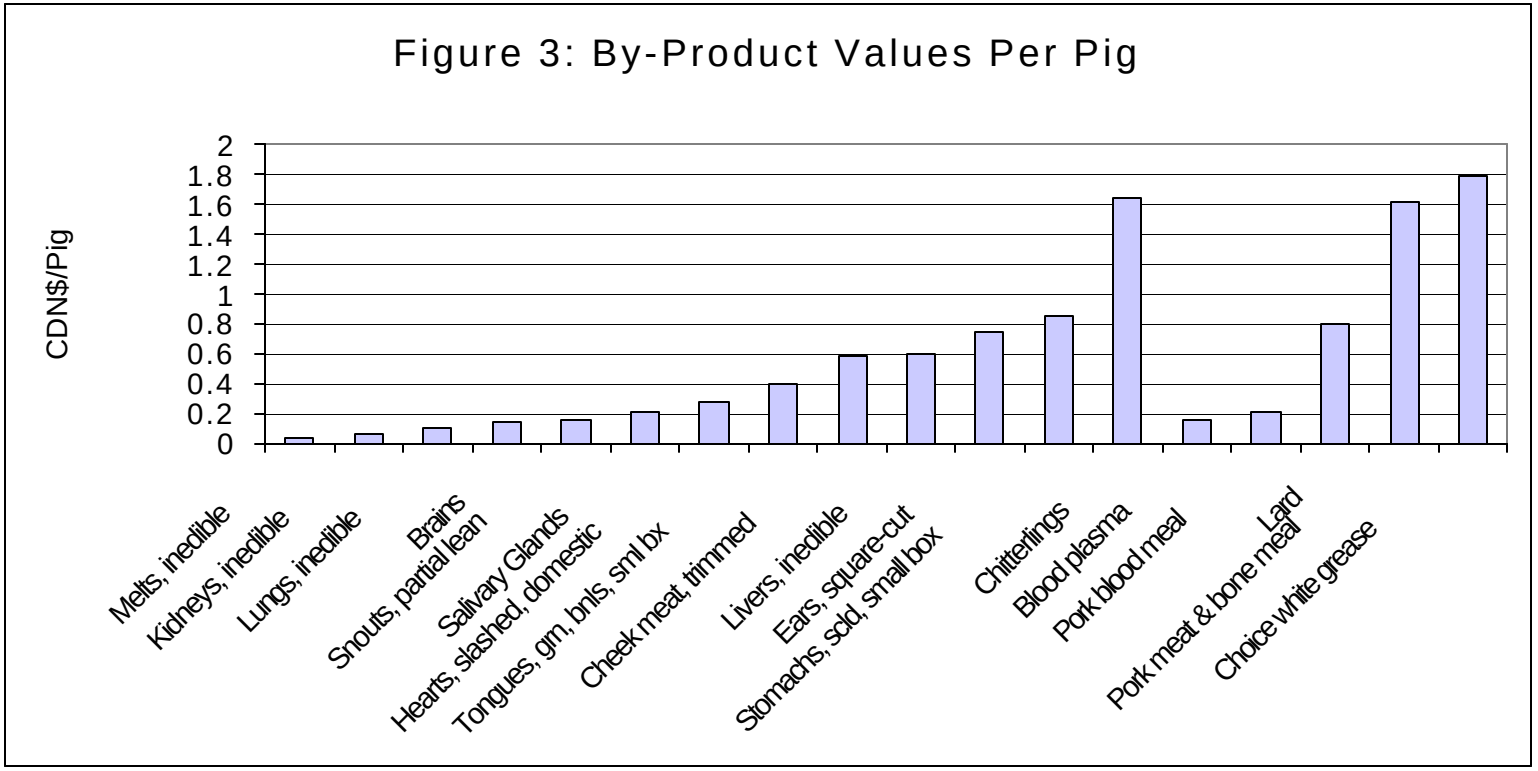

Source: See Table 2

Table 1: The Impact of Feed Cost Changes on Profitability[1]

Hog Price $	Total Revenue per hog[3] $	BSE Tax[2] $	Feed Cost FC $	1% rise FC $	3% rise FC $	6% rise FC $	Total Variable Cost (TVC) $	FC/TVC %	TC $	FC/TC %	Net Return $	Profit Margin %
157.08	160.19	0	75.47	-	-	-	116.55	65	140.49	53	19.70	12.3
157.08	160.19	0	-	76.22	-	-	117.30	65	141.24	54	18.95	11.8
157.08	160.19	0	-	-	77.73	-	118.81	66	142.75	55	17.44	10.9
157.08	160.19	0	-	-	-	80.00	121.08	66	145.02	55	15.17	9.5
157.08	160.19	5.00	-	76.22	-	-	122.30	62	146.24	52	13.95	8.7
157.08	160.19	5.00	-	-	-	80.00	126.08	63	150.02	53	10.17	6.3

[1] The profit margin is Net Return/Total Revenue.
[2] The "BSE Tax" is the name used to refer to the implicit extra costs imposed to comply with new potential food safety regulations.
The amount ($5.00) is arbitrary being based on an estimate of the tax in Britain. The cost of disposal would be the appropriate amount to use if all animal by-product wastes must be disposed.
[3] Total revenue includes the value of cull sows and boars - Cull Sows @ $110.67/ckg, Cull Boars @ $44.05/ckg, 155kg dressed sow weight, 201kg live boar weight.

Source: Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Swine Enterprise Budget for 2000 was used for the basic input on Hog Price, Total Revenue, Base Case Feed Costs, Variable Costs and Total Costs.

Table 2: By-Product Quantities and Values[1]

By-Product	By-Product Quantity	By-Product Price	By-Product Value/hog
	Lbs./cwt.	$US/cwt.	$CDN/hog[2]
Cheek meat, trimmed	0.28	57.25	0.58
Chitterlings	1.26	36.00	1.65
Ears, square-cut	0.19	108.50	0.75
Tongues, grn, bnls, sml bx	0.18	60.00	0.39
Hearts, slashed, domestic	0.28	27.00	0.27
Kidneys, inedible	0.25	7.63	0.07
Livers, inedible	1.25	13.08	0.59
Melts, inedible	0.17	6.08	0.04
Salivary Glands	0.26	22.75	0.22
Snouts, partial lean	0.25	17.50	0.16
Stomachs, scld, small box	0.43	54.75	0.86
Brains	0.07	56.00	0.14
Lungs, inedible	0.95	2.96	0.10
Choice white grease	4.40	11.00	1.80
Pork meat & bone meal	4.40	9.93	1.62
Pork blood meal	0.30	18.63	0.21
Lard	1.72	12.50	0.80
Blood plasma	0.20	20.00	0.15
Totals:			
Live hog basis	16.84		10.40

[1] Values are fob Central United States, June 22, 2001

[2] Converted from a 250 pound animal in US to 245 a pound animal in Canada, and $1.5152CDN/$US.

Source: USDA, and Rothsay Rendering Inc. for the by-product factors for rendered products