

**The Troubled Corn Economy of Ontario's Livestock Sector:  
A Strategic Policy Analysis**

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## **1. Introduction**

Ontario is, and has historically been, among the leading livestock and red meat production regions in Canada. However, it finds itself in a different situation today. Through the fall of 2007 and winter and spring of 2008, the red meat segment in Ontario suffered through some of its worst returns on record. In the case of hogs, this was coincident with historically high hog marketings

Many of the factors ailing the Ontario cattle and hog industries are structural and apply equally across regions, such as currency exchange rates. However, the complexity of the Ontario situation is rooted in historical developments including changes in breed types, marketing weights, and indigenous grain corn availability. These must be fully understood if the situation is to be appropriately diagnosed and improved for the red meat segment.

### ***1.1 Purpose and Approach***

The purpose of this paper is to develop a strategic policy framework within which to analyze the development of the Ontario livestock/red meat sector up to this point and validate it with data. This framework is then applied in the context of Ontario red meat to evaluate apparent policy alternatives.

### ***1.2 Organization of the Paper***

Section 2 below develops the basic context for industry development and competitiveness. Section 3 develops a historic context within which to interpret the development of red meat livestock in Ontario. Section 4 develops a conceptual and empirical model of the Ontario red meat livestock segment. Section 5 concludes the paper.

## **2. Conceptual Framework**

The term “competitiveness” is frequently invoked in evaluating the current state or development of an industry. This notion begs a more precise definition. The literature on the development of industries and farm product segments is vast, and contains alternative approaches. Some studies have looked at the development of an industry or sector from an internal growth perspective, in which the combination of resource endowments and investment in innovation propel growth. Others have focused on multifactor productivity, in which the returns generated by specific inputs are studied. The notion of competitiveness is invoked both within economies and in international trade.

One of the areas in which these approaches converge is on value of outputs relative to the value of inputs consumed. This allows an industry to defend or grow its market position, whether that relates to outputs, inputs, or both. For example, in the early 1990's, the Canadian Agri-Food Competitiveness Council established the following definition of competitiveness: “*the ability to sustainably maintain market share*”. Given this definition, one can only maintain market share if the value of outputs exceeds inputs; it is only sustainable if its outputs are valued more than those of competitors, such that ready access scarce inputs can be maintained.

Alternatively, competitiveness may be defined as “*the ability to profitably compete for residual inputs*”. In this context, a nation or industry can only be sustainable in competing for inputs if the value of output produced from a given input is higher than that for competitors for the input, or if the input is used more efficiently to produce the same value of output compared with competitors.

### **2.1 Competitiveness in Ontario Livestock**

In red meats, Canada moved to an export focus in the 1980's, based purely on the intensity of production compared with the size of its domestic market. Thus, competitiveness and growth is outward-looking (cost compared with red meat producing industries in other countries) as well as its competitiveness compared with other segments of the economy)<sup>1</sup>.

Secondly, as reflected above, the driver of competitiveness can be either the relative value of output produced or the relative cost of input. Because trade in red meats tends to be largely treated as a commodity business, we focus on relative costs.

Following from cost competitiveness and residual inputs as a focus, a logical question is “what is the residual input”? The second definition of competitiveness above refers to residual inputs. Residual inputs are inputs that, for whatever set of reasons, are indigenous and fixed to a specific geography, subject to competition across uses, and

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<sup>1</sup> This is an important distinction as livestock is increasingly driven to compete with resources that are mobile across segments of the economy rather than specific to agriculture- notably labour and capital.

very important component of the production process. Put differently, residual inputs frame the cost factors that cause an industry to locate in one region or another. It is largely based on these factors that the industry drives its *raison d'être*.

In livestock, this factor tends to be feed grains. What differentiates one region from another is the price and production cost of feed grains, which in turn is built upon the agronomic productivity in a region to support production of feed grains.

## **2.2 Summary- Competitive Rationale for an Ontario Livestock Industry**

In the international commodity livestock and meat segment, the key driver of a region's competitiveness is cost. Because productive technologies tend to be readily dispersed across regions, the key competitive aspect of cost relates to natural productive conditions (soil, climate, etc.) which by definition are not transmissible across regions. The manifestation of these factors is the region's feed grain production, and relative price.

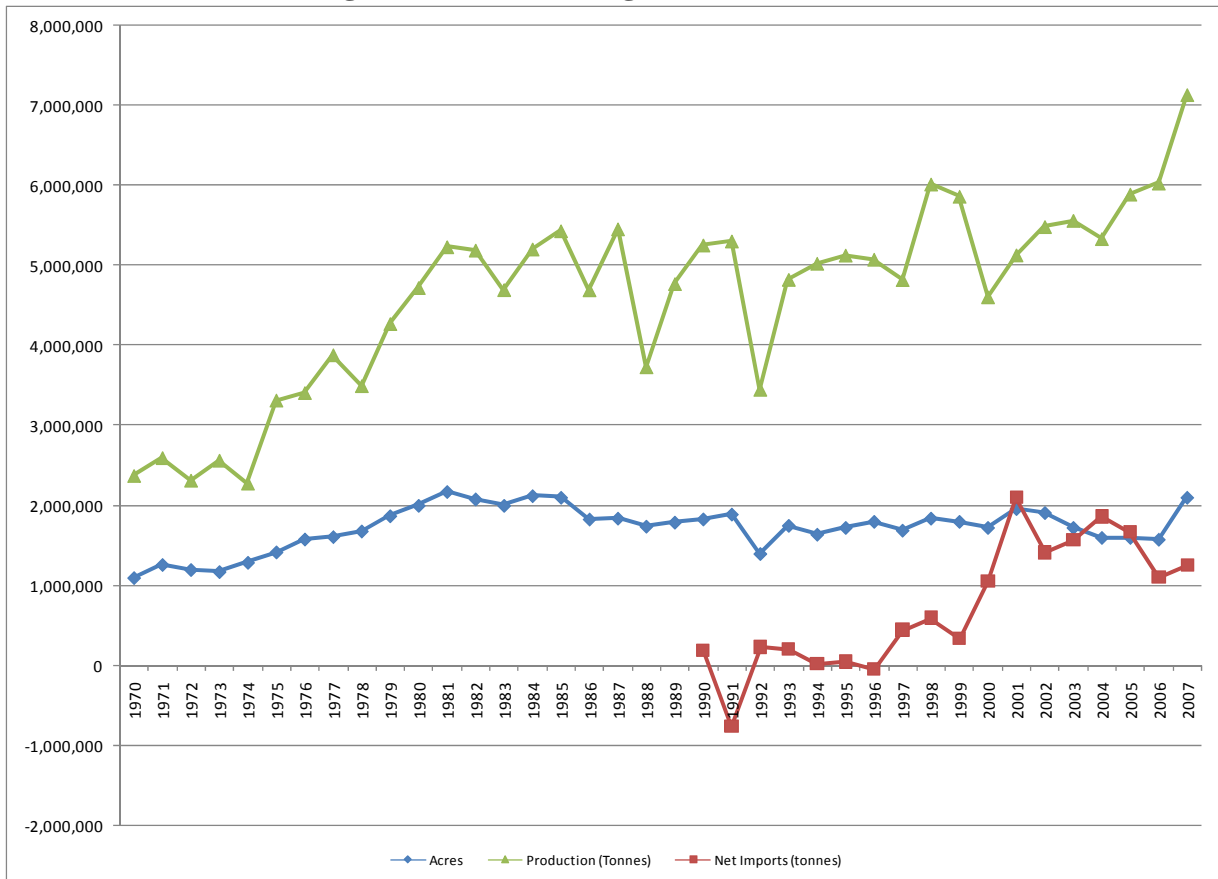
### 3. The Development of the Ontario Livestock-Corn Economy

This section provides an overview of the development of the major export oriented livestock segments in Ontario with a view toward how corn has influenced their development and how they have used corn. Section 3.1 presents an overview of the Ontario corn segment over time. Section 3.2 presents an overview of the Ontario beef cattle segment and its development over time. Section 3.3 provides a brief discussion of the Ontario swine industry's development. Section 3.4 draws observations from its preceding subsections.

#### 3.1 Evolution of Ontario Corn

Grain corn acreage in Ontario grew rapidly through the 1970's and early 1980's, peaking at just over 2 million acres. Since then, grain corn acreage has been decreasing. This is depicted in Figure 3.1 below. Grain corn production has not seen the same trend, with production mostly leveling out around 5 million tonnes. Recent years have seen a significant production increase toward 6 million tonnes, and a large 2007 crop resulted in production of over 7 million tonnes. At the same time, corn imports have increased. In much of the 1980's, Ontario was a net corn exporter; however, as shown in Figure 3.1 below, since 2000 corn net imports in Ontario have been material and have ranged between 1 million and 2 million tonnes.

**Figure 3.1 Corn Acreage and Production**



At the same time, the nature of corn use in silage has changed quite dramatically. This is illustrated in Figure 3.2 below. The figure shows that, since its peak in the late 1970's, corn silage acreage has decreased by more than half and has leveled off at about 300,000 acres.

The nature of corn pricing in Ontario has also experienced a significant evolution. Throughout much of the 1980's Ontario was a net exporter of corn and as such, corn prices in Ontario were at a discount to Chicago futures. An indication of this is presented in Figure 3.3 below, which plots the average Chatham Ontario board basis for the period 1986 to 1990. The figure shows that, even with the drought of 1988 included in the average, the Chatham basis averaged \$Can .10/bushel to \$Can .20/bushel under Chicago, with the exception of a pre-harvest season strengthening in the basis. Since 1990, a general strengthening of the basis has occurred in Ontario. This is illustrated in Figure 3.4, which plots the Chatham track basis since 1990. The figure shows that strengthening in the corn basis occurred in the early and mid-1990's, and that the corn basis strengthened markedly in about 2000, consistent with the increases in corn imports observed above.

Thus, while corn production in Ontario has been steady and (recently) increasing, pricing has shifted from a discount compared with the US Midwest to be a premium to the Midwest, and Ontario has become a significant net importer. At the same time, acreage devoted to corn silage has decreased materially.

**Figure 3.2 Ontario Corn Silage Acreage**

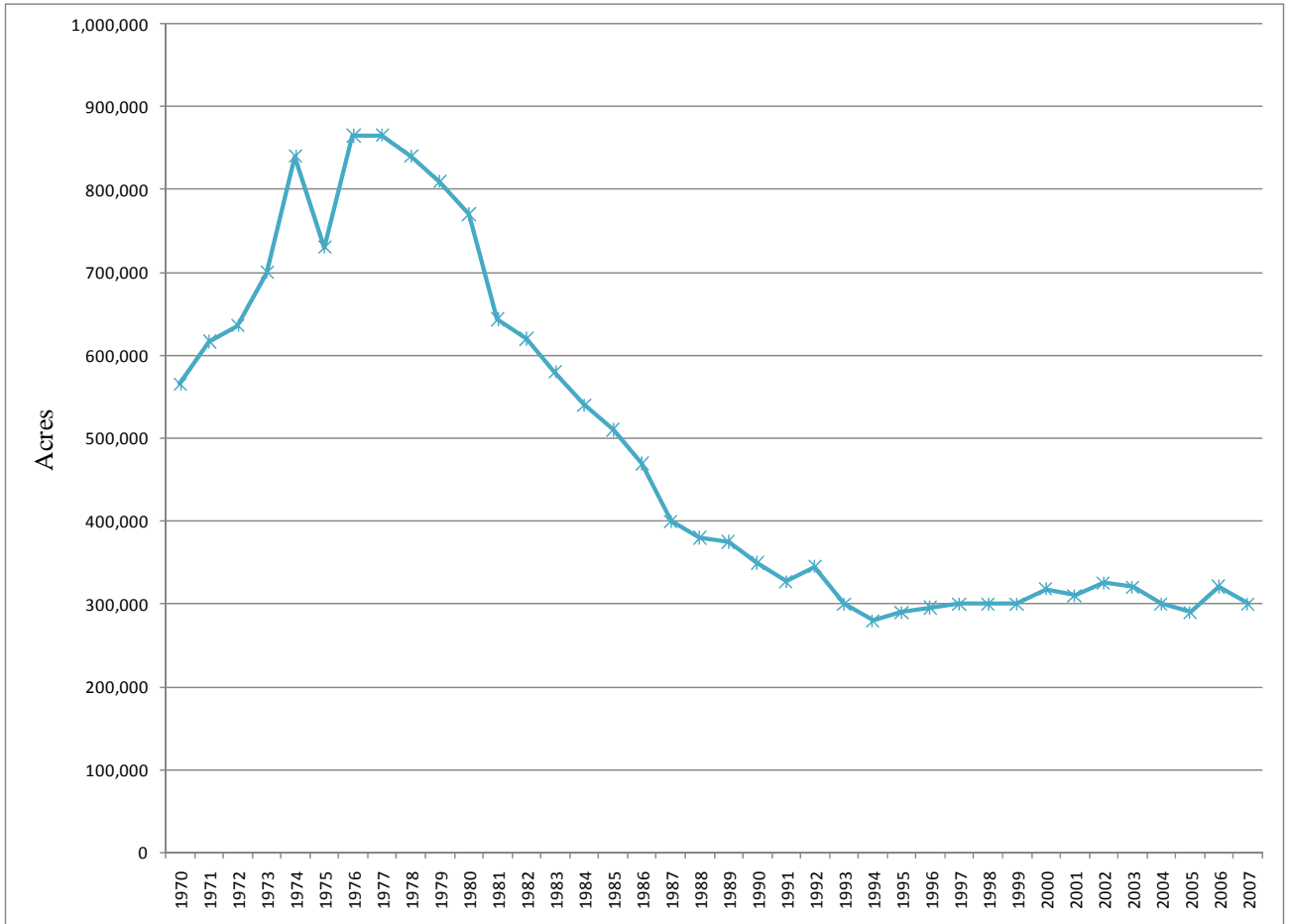
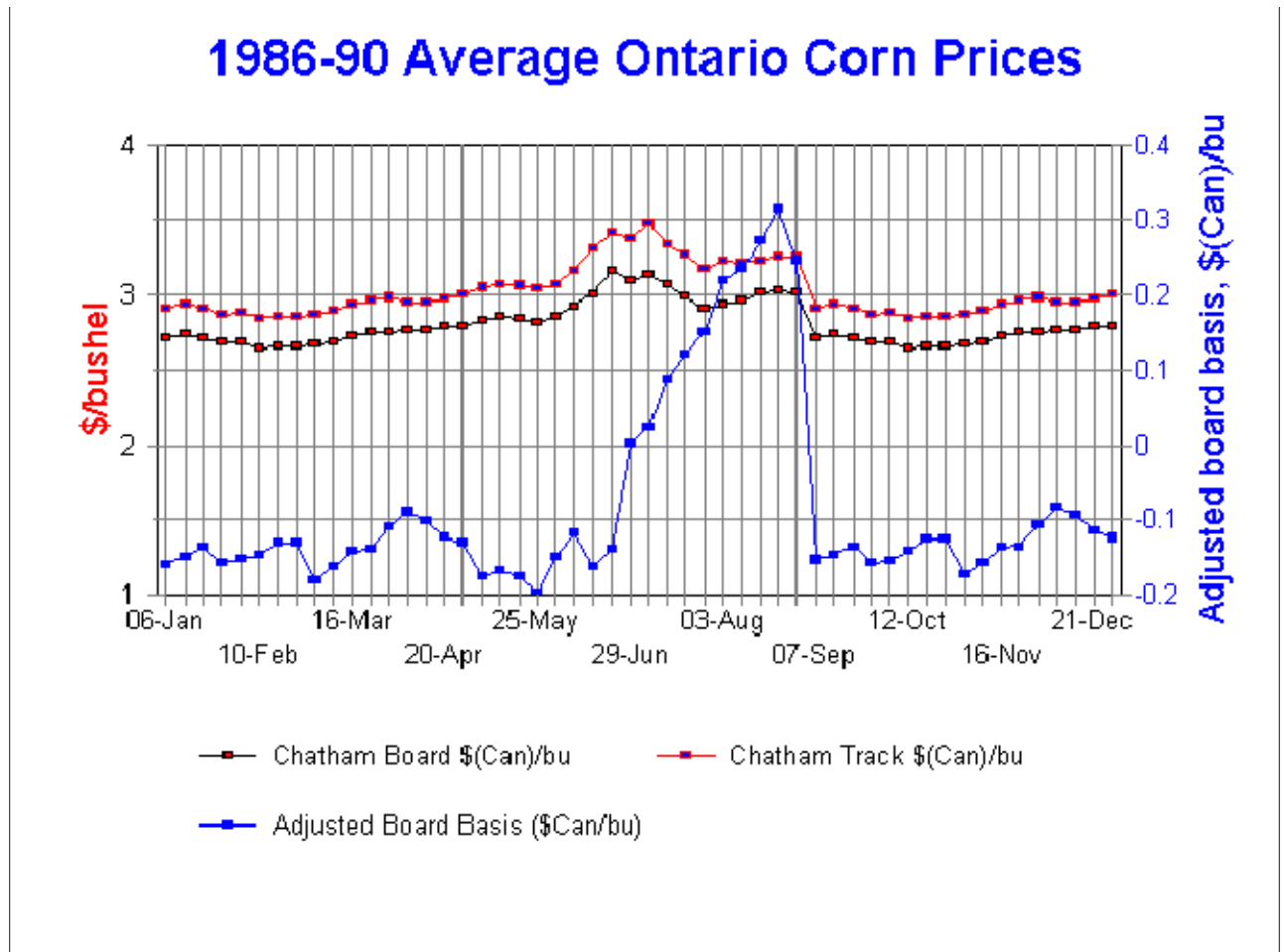


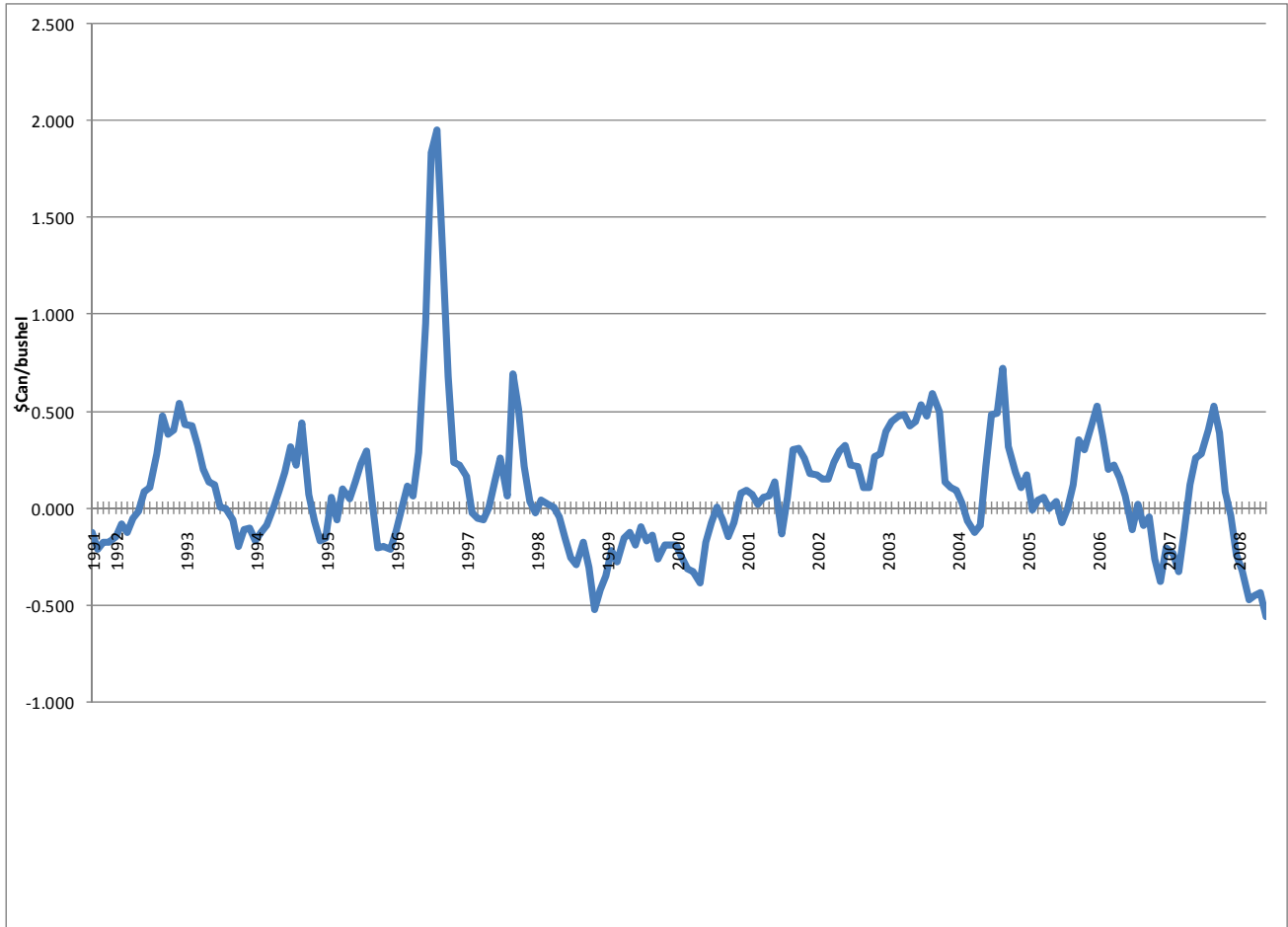
Figure 3.3 Chatham Ontario Board Corn Basis, 1986- 1990



Source: Ontario Corn Producers Association



**Figure 3.4 Chatham Ontario Track Corn Basis, September 1990- June 2008,  
Monthly (\$Can/bushel)**

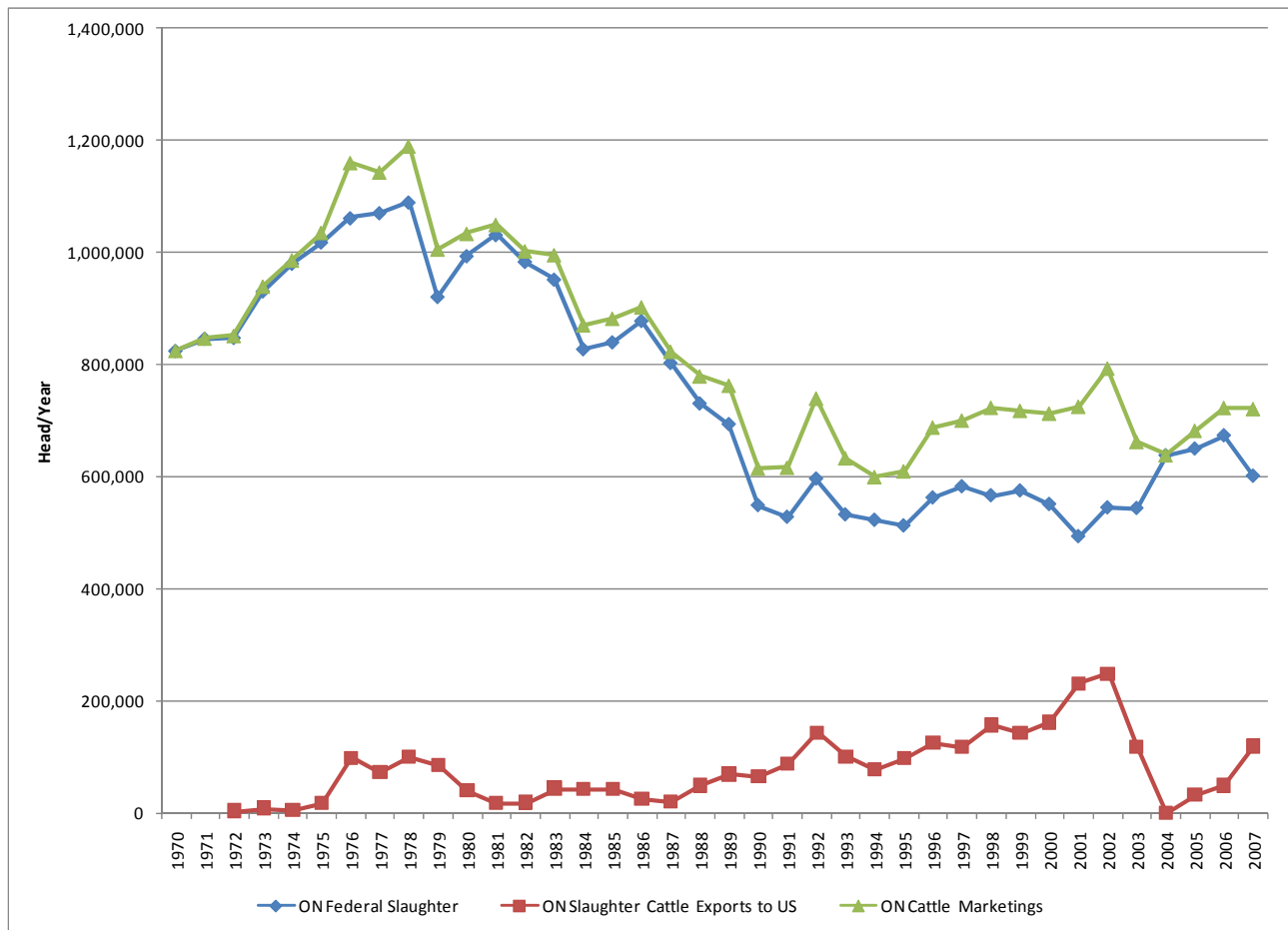


### 3.2 Evolution in the Ontario Cattle Industry

The Ontario fed cattle slaughter peaked in the mid-1970's at marketings of almost 1.2 million head. Since then, consistent with the broad decline in per capita consumption of beef, cattle marketings in Ontario have decreased to 600,000 to 800,000 head per year, and a trend toward increasing cattle exports. This is presented in Figure 3.5 below. The figure plots the slaughter of steers and heifers in Ontario plants and exports of Ontario cattle, with estimated marketings taken as the sum of the fed cattle kill and fed cattle exports. Since data on cattle marketings is not collected, in the data presented in the figure it is assumed that the kill of fed cattle from other provinces in Ontario plants is approximately equal to the provincial slaughter.

From the figure, in addition the general decrease in the Ontario slaughter, it is clear that there has been a move toward an export basis for cattle. This has occurred largely as Ontario slaughter capacity rationalized to decreased marketings, and Ontario moved away from excess slaughter capacity.

**Figure 3.5 ON Cattle Marketings**



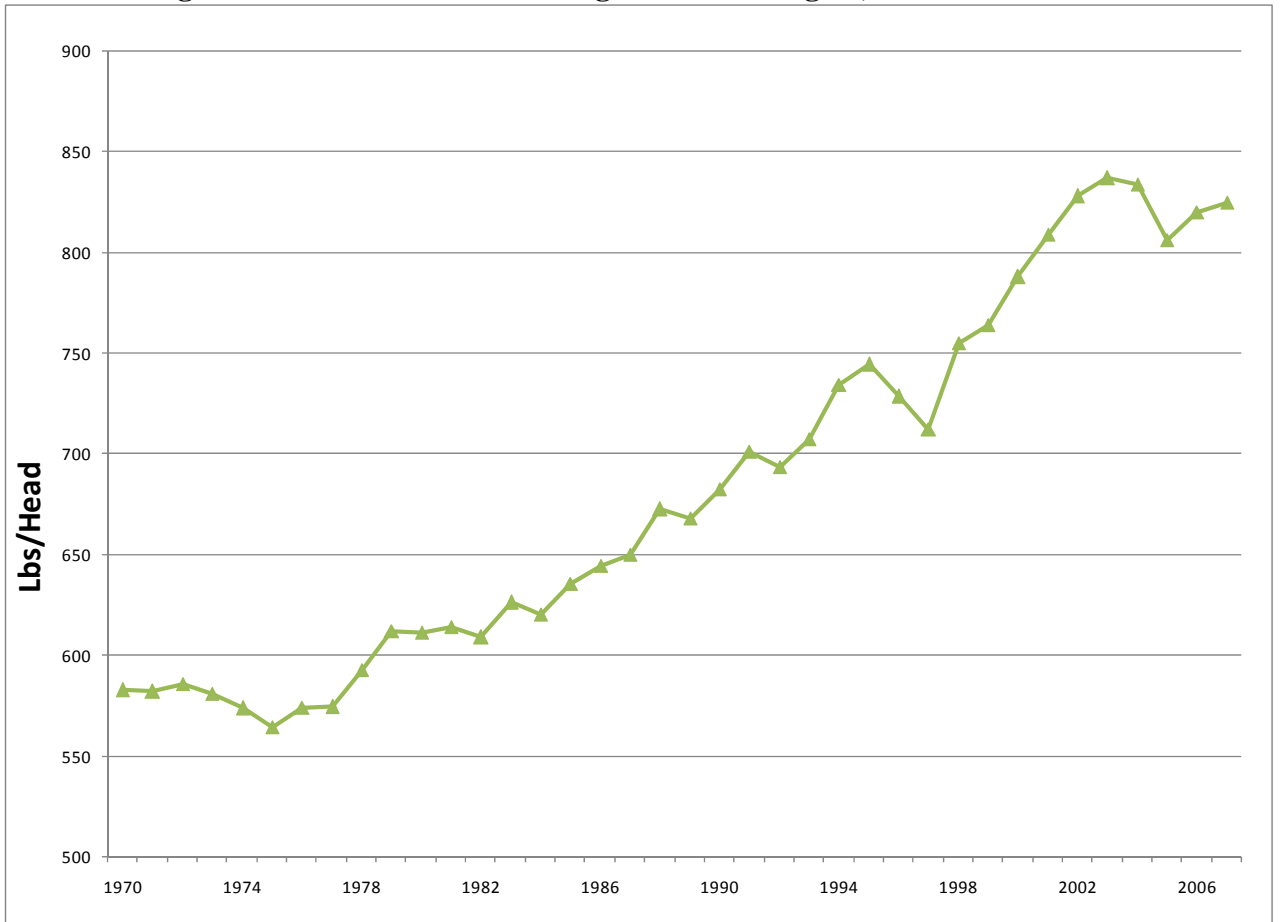
The data on cattle marketings suggest that beef production and the implied corn feeding of cattle have declined since the mid-1970's. However, this disregards the transformation toward larger frame slaughter cattle and the changes in cattle rations. Figure 3.6 below provides the context within which to interpret the transformation of the cattle industry from primarily smaller framed, British breeds toward larger, continental European breeds. The figure shows that up until the early 1980's, carcass weights averaged around 600 lbs/head. Through the mid-1980's until today, carcass weights have increased, and have increased by more than 50% over the period.

When the trend in carcass weights is taken with the decrease in cattle marketings, a different image in terms of beef production and corn demand emerges. This is illustrated in part in Figure 3.7. The figure shows that when marketings over time are multiplied by average carcass weights over time, the implied decrease in beef production is significantly mitigated. In fact, between the early-1990's and the BSE case of 2003, the implied total carcass weight of slaughter cattle marketed in Ontario increased by about 50%.

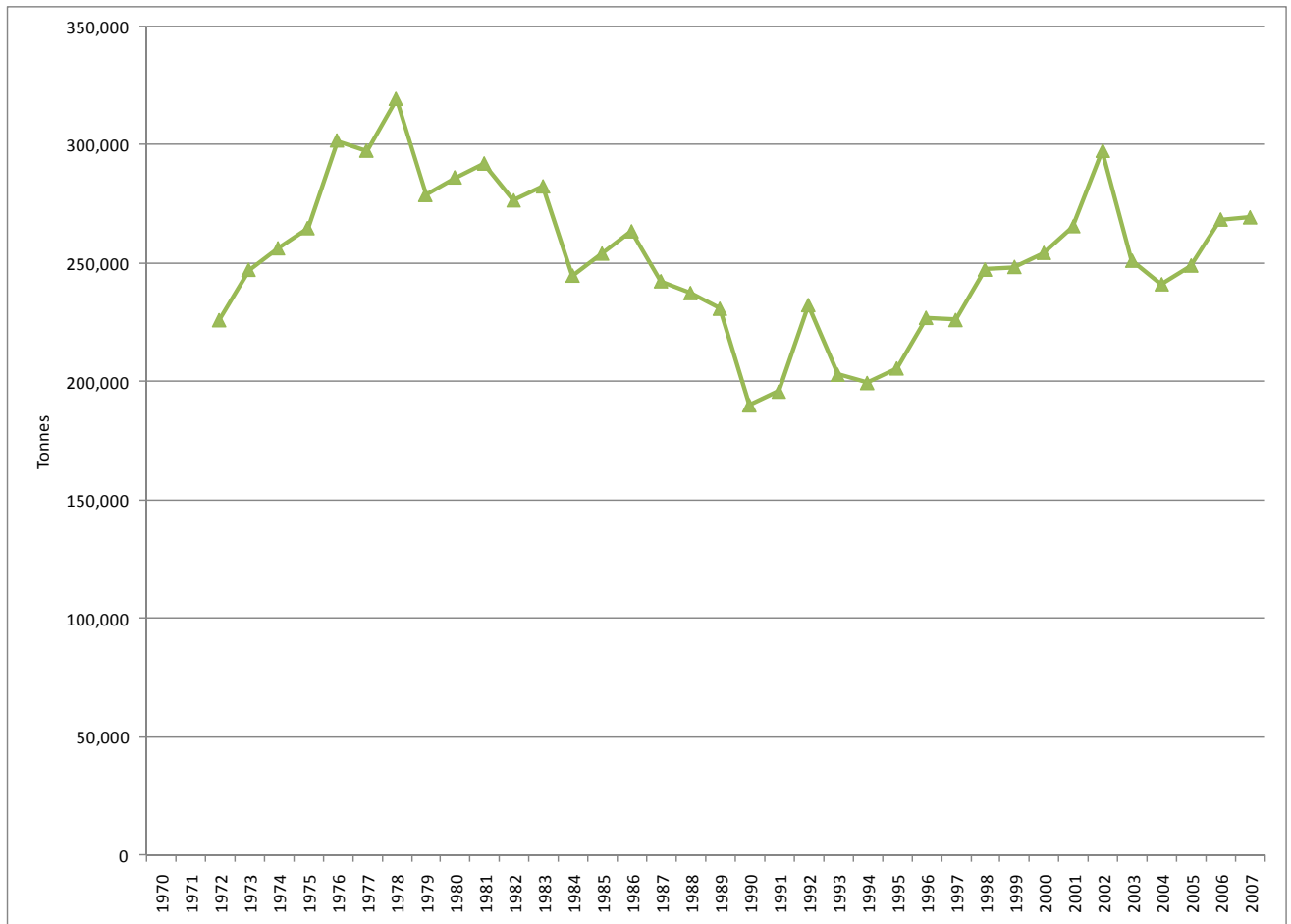
In addition, it must be noted that as the shift toward feeding to higher carcass weights occurred, not only was more corn consumed in beef production, but a replacement of corn silage with grain corn occurred. The smaller frame beef breeds that were common in Ontario feedlots in the 1970's could develop a finish largely (or entirely) on corn silage. As larger framed breeds were adopted, a suitable finish could not be obtained from corn silage and grain corn was used to replace silage.

Thus, as the Ontario cattle industry has appeared to shrink, in practice a smaller number of much larger cattle have largely mitigated the implied decrease in the beef supply. At the same time, the corn demand from Ontario cattle feeding has very likely increased rather than decreased consistent with the larger weight animals and substitution for corn silage.

**Figure 3.6 Ontario Cattle Average Carcass Weights, Lbs/Head**



**Figure 3.7 Tonnes of Beef Carcass Weight Marketed, Based on Fed Cattle Marketings and Carcass Weights**

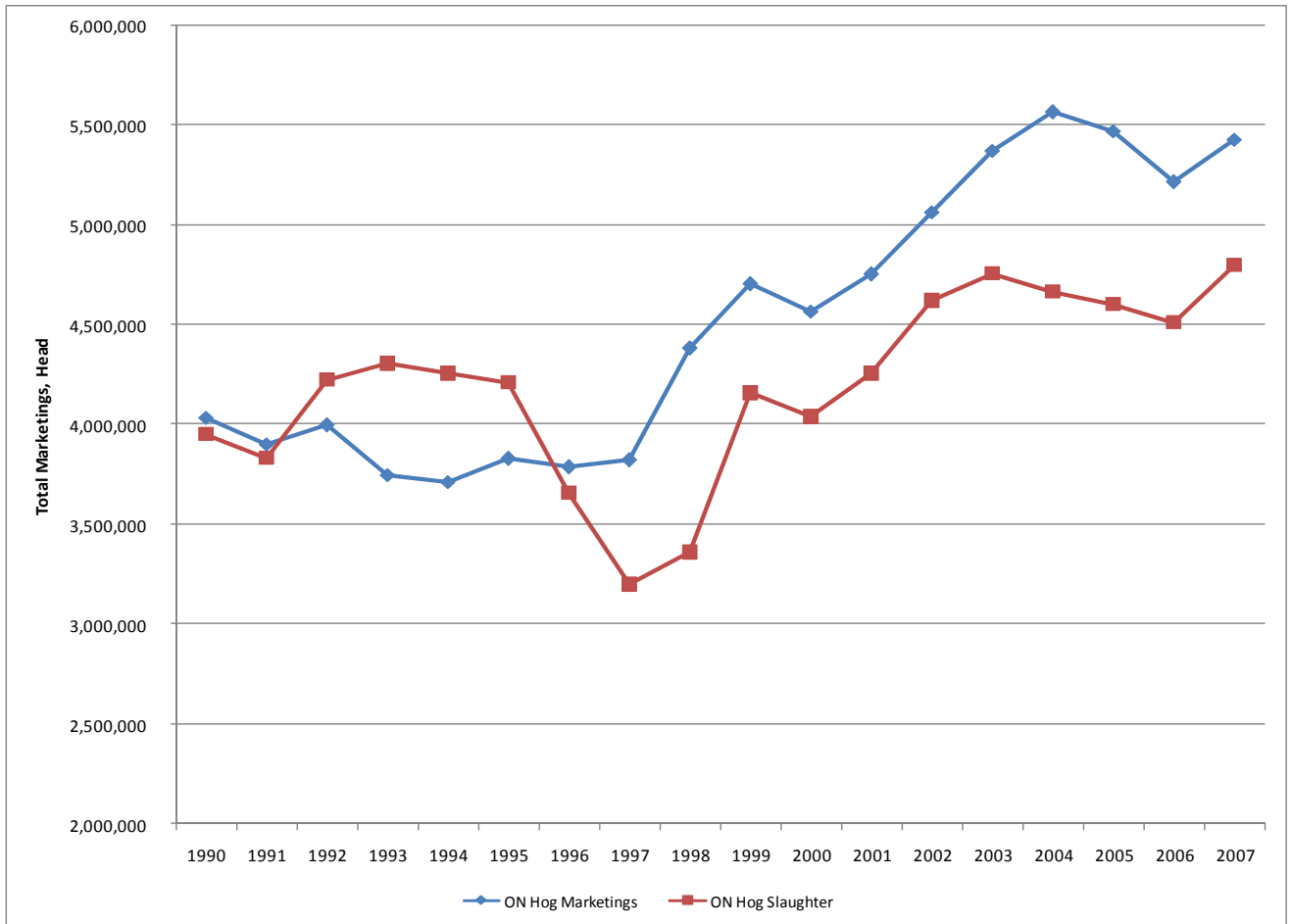


### 3.3 Evolution in the Ontario Hog Industry

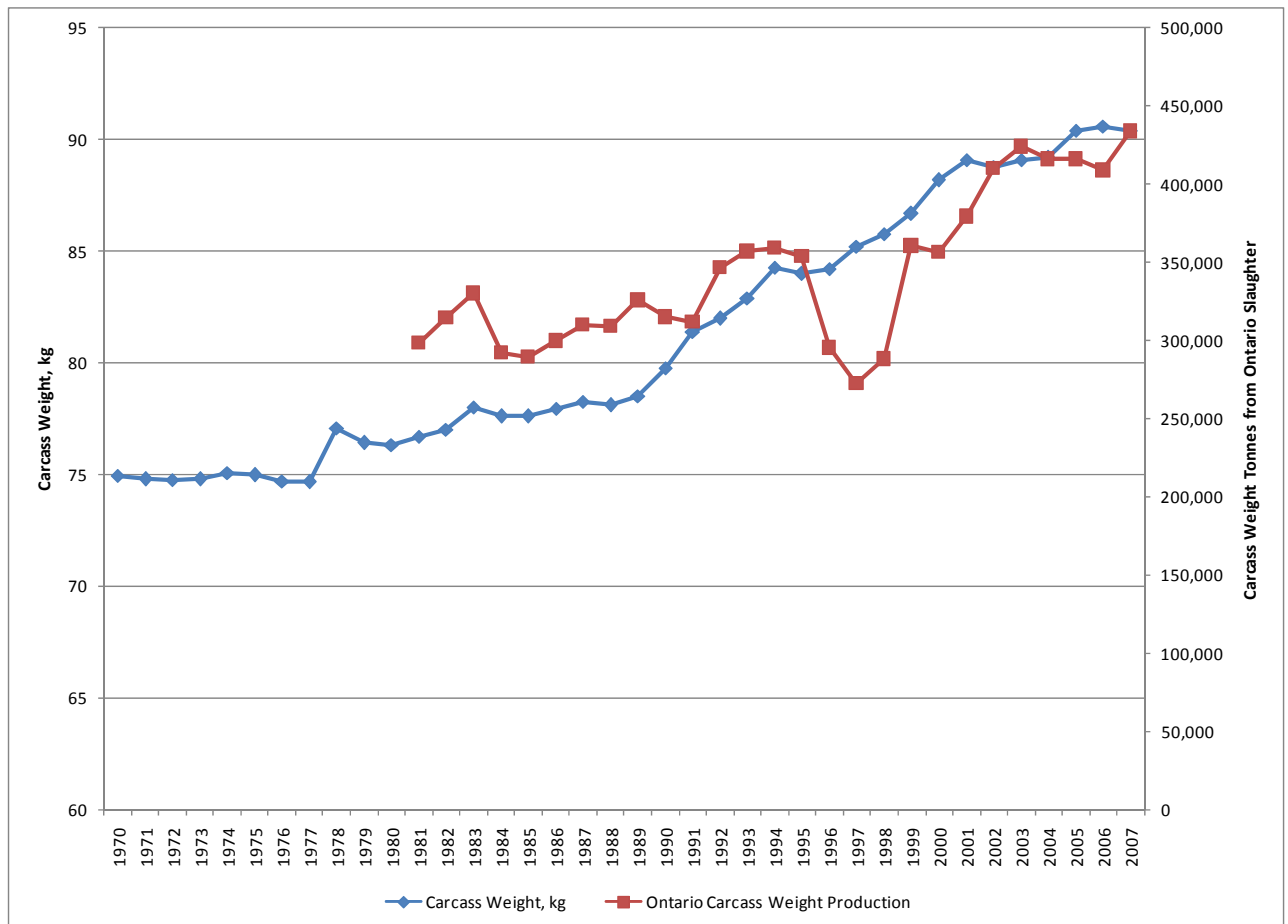
The Ontario hog industry grew rapidly in the 1990's. Between 1990 and 2002, Ontario hog marketings increased by 25%. This is illustrated in Figure 3.8 below. In addition, marketings of slaughter hogs to Quebec and the US increased markedly, from around 500,000 head in 2000 to over 1 million by 2007. More generally, the move to an export basis for hogs is indicated by the difference between hog marketings and slaughter since the mid 1990's which lead to an effective export pricing basis for hogs in Ontario.

As with cattle, marketings only reveal part of the story in hogs. As marketings increased, carcass weights also increased. This is illustrated in Figure 3.9. Between 1970 and 2007, the average hog carcass weight increased from 75 kg to over 90 kg. When multiplied by the federal and provincial plant slaughter in Ontario, the implied carcass production increased by almost 50% between the 1980's and 2007.

**Figure 3.8 Total Ontario Hog Marketings and Ontario Hog Slaughter**



**Figure 3.9 Ontario Hog Carcass Weights, and Implied Ontario Hog Carcass Production**



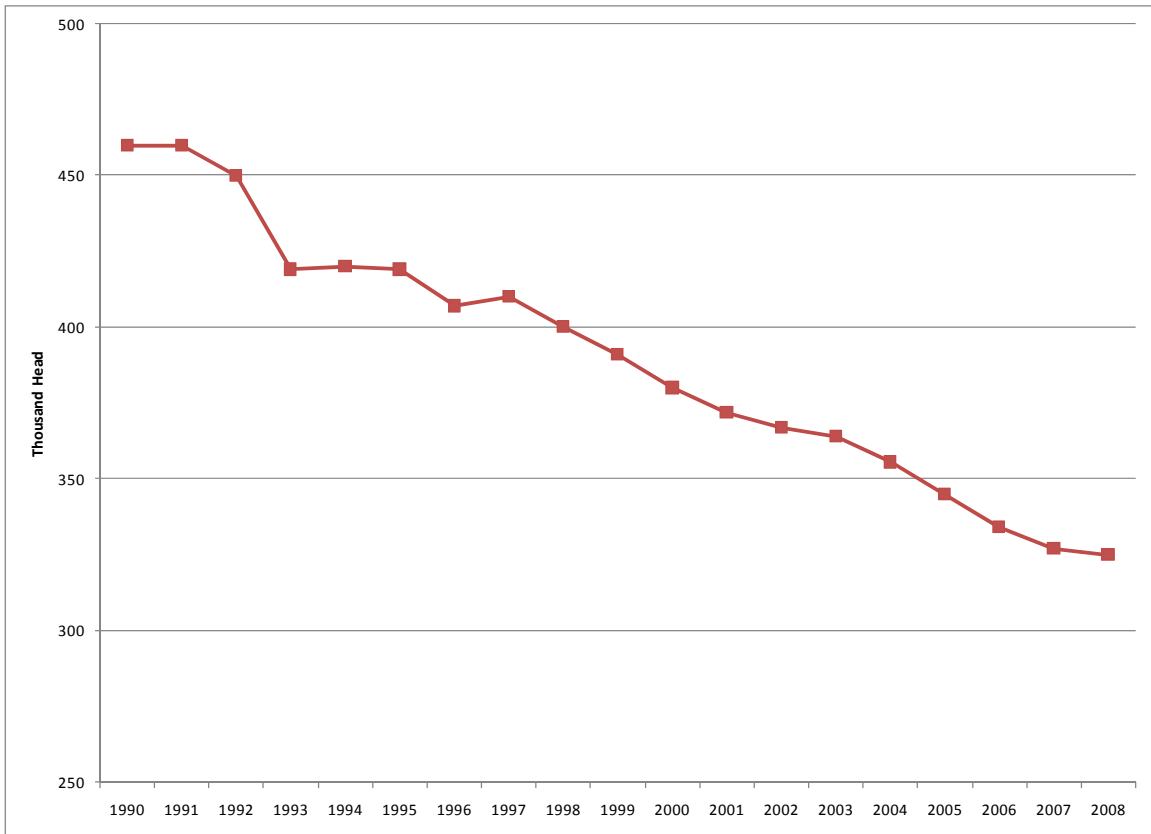
### 3.4 Overall Demands on the Ontario Corn Supply

The primary demand on the corn supply in Ontario can be broken down into three components:

- Feed demand from red meat livestock (primarily beef cattle and hogs)
- Feed demand from supply managed livestock
- Demand from food and industrial uses.

The general nature of the red meat group is described above, and it must be noted that the increased draw on the corn supply occurred on an export basis for livestock.. Within supply managed livestock, corn is consumed by dairy cows, broiler chickens, turkeys, laying hens, and hatching egg layers. The trend in dairy cow inventories is presented in Figure 3.10. The figure shows that since 1990, the Ontario dairy cow inventory has decreased to just under 350,000 head.

**Figure 3.10 Ontario Dairy Cow Inventory**

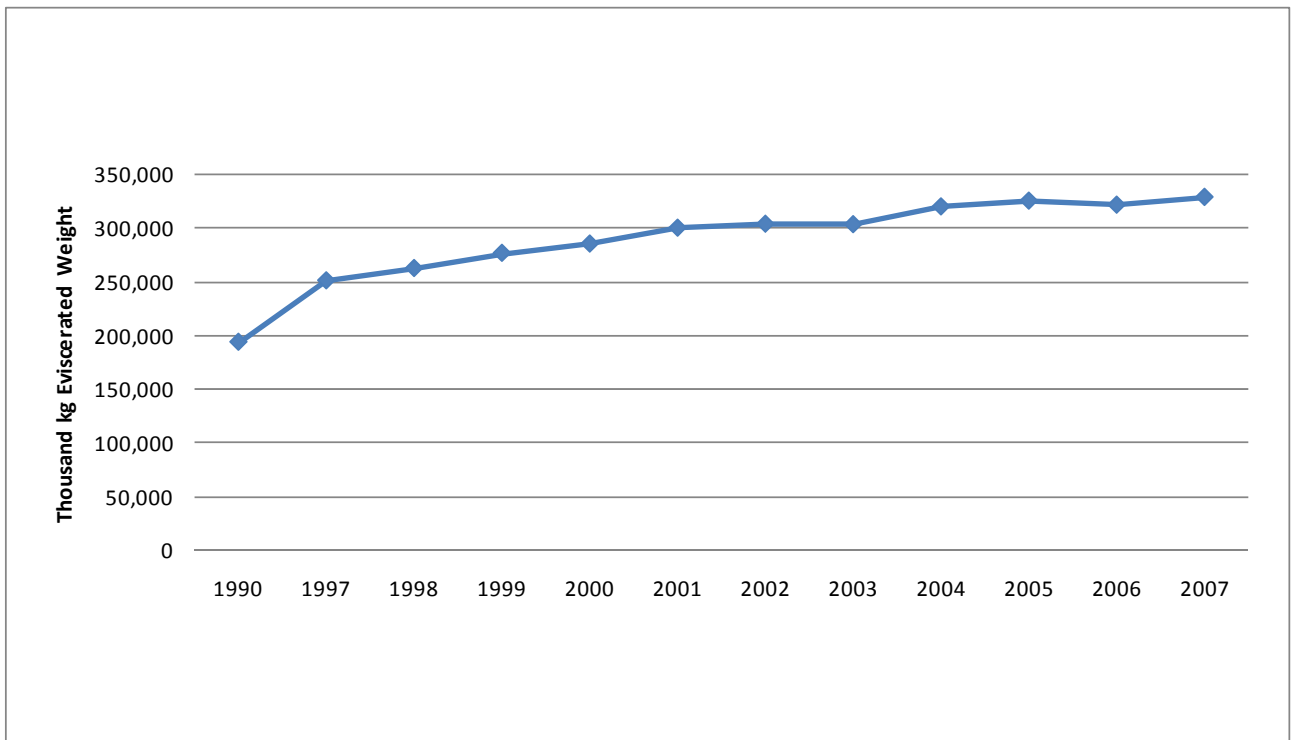




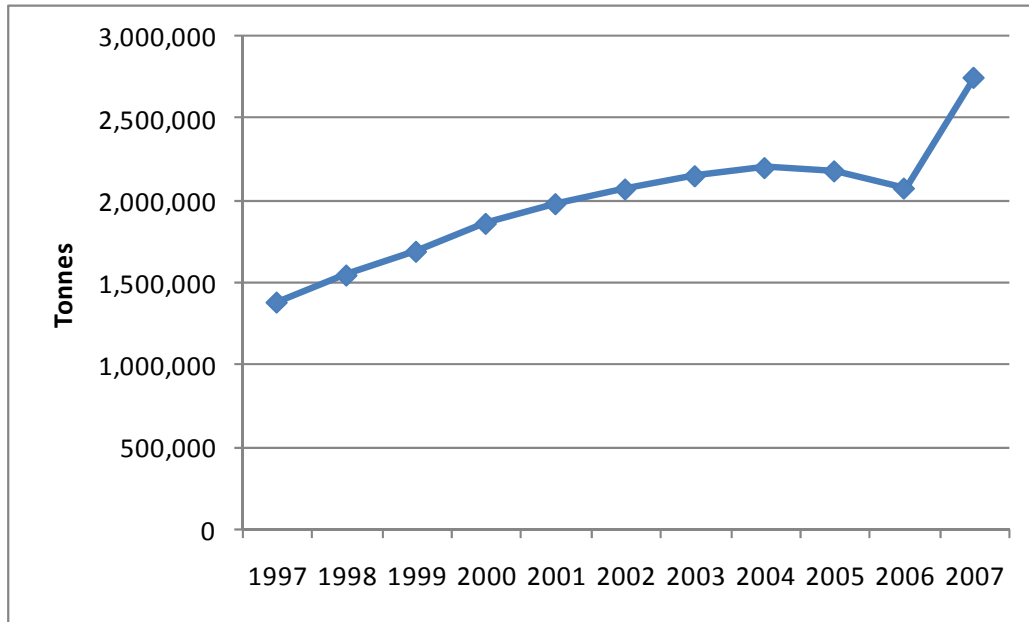
Thus, not accounting for changes in the intensity of grain in dairy rations, the corn demand from dairy cows has decreased. At the same time, the poultry segments have broadly increased. The most significant illustration of this is in broilers, as illustrated in Figure 3.11 below. The Ontario chicken slaughter has increased by about 25% since 1997, and by fully 50% since 1990.

The demand for corn used in food and industrial uses has generally grown more slowly than the demand in poultry feeds. However, it has become a significant consumer of corn in Ontario. Figure 3.12 presents trends in food and industrial uses of corn. It shows that food and industrial use has ranged just over 2 million tonnes in recent years, but has recently increased to about 2.7 million tonnes. As Canada and Ontario adopt ethanol blend mandates and new ethanol plants are established, corn use in the food and industrial use category can be expected to increase further.

**Figure 3.11 Ontario Broiler Chicken Production**



**Figure 3.12 Food and Industrial Use of Corn in Ontario**



### 3.5 Observations

Ontario corn production has increased moderately since the mid-1980's, with the notable exception of large crops in 2006 and 2007. Broadly speaking, this has been insufficient to meet demand growth from feed, food, and industrial use as evident from increasing imports, and a strengthening corn basis that puts users of corn at a cost disadvantage to the US.

In this environment, one might expect the residual users of corn, that is, industries that lack protection or subsidy support, to cut back on corn consumption. However, as observed above, the draw on the corn supply from cattle has not decreased proportional to marketings; rather it has increased. Thus, Ontario must be faced with a situation in which there is significant stress on the corn supply to provide for uses that are supported or protected in one form or another, and also to support export oriented red meat livestock, at least at historic levels. The economics of this situation are explored in the next section.

#### **4. Tradeoffs in Restoring Competitive Red Meat Livestock Segment in Ontario**

In section 2, it was argued that corn and competitive pressures to access it are the primary issues framing the cost competitiveness in Ontario cattle and hog feeding. The description of the Ontario corn market and the livestock, food, and industrial segments that draw upon corn suggested that Ontario's ability to supply these consuming segments in a cost competitive fashion was greatly strained. This may help explain the protracted difficulties that have faced the Ontario cattle and hog segments.

The purpose of this section is to link corn as the critical input in livestock competitiveness with the competitive demands placed upon it in the Ontario marketplace, and to put in perspective the growth in the cattle and hog segments in Ontario. To do so, Section 4.1 develops a model of residual corn consumption in the Ontario marketplace. Section 4.2 presents the empirical model. Section 4.3 presents results using the model.

##### ***4.1 Residual Corn Consumption: A Conceptual Model***

To understand the implications of the evolution in corn production and the implied consumption in Section 3, the following conceptual model was developed. We start with the assumption, consistent with the discussion in Section 2, that any jurisdiction that has a significant dependence upon exports in commodity beef or pork must have a cost advantage linked to feed. In its weakest form, this assumption can be interpreted as meaning that a jurisdiction cannot sustainably grow an export market if it is reliant on corn imports from its most significant competitor. For Ontario, this means that an export oriented beef and pork industry cannot be built on corn imported from the US because the cost of corn in Ontario will be the US price plus freight, and because Ontario competes with the US in its domestic market and in other export markets, cattle and hog prices will be US price less freight and export certification.

Secondly, we assume that cattle and hogs are the residual claimants on corn in Ontario. The rationale for this is that segments that have the benefit of protection (supply management) or subsidy (ethanol), or serve broadly higher valued markets (food) are in a preferred position to bid for corn compared with export competing segments like beef and pork.

Thus, the conceptual model frames the following question. If Ontario cannot sustainably support export competitive corn-consuming industries on imported corn (especially when they are selling on an export basis, and given that cattle and hogs are the residual claimants on corn, what levels of cattle and hogs should Ontario expect to produce sustainably, and how does that compare with historical cattle and hog marketings?

##### ***4.2 Empirical Model***

To implement the conceptual model described above, the following was undertaken. Data on average Ontario corn production for the period 2003-06 was obtained. From

this, average consumption over 2003-06 in food and industrial uses was subtracted. This provided an estimate of the indigenous corn available for feed use.

Next, the corn consumption across major livestock species was obtained. For hogs, dairy, and broilers, parameters were obtained from the George Morris Centre Feed Grain Cost Optimization model, which is based on US National Research Council values. For others, industry sources and assumptions based on feed conversion and corn inclusion rates were used. These are presented in Table 4.1 below.

**Table 4.1 Per Head Corn Consumption, by Species**

Species	Corn Consumption/head	Annual Inventory/Slaughter, 2003-06 Average, Head
Fed Cattle	2 tonnes	686,526
Market Hogs	.223/tonnes	5,418,142
Dairy cows	2.04 tonnes	340,325
Broiler Chickens	.0021 tonnes	202,226,750
Turkeys	.014 tonnes	93,379,000
Laying Hens	.0194 tonnes	9,596,250

For species marketed under supply management, the values in Table 4.1 were multiplied by the average 2003-06 annual slaughter (broilers and turkeys) or average January 1 inventory (dairy and layers). The result was the total feed demand from supply management. To obtain the indigenous corn available for hogs and cattle, the feed demand from supply management was subtracted from the corn available for feed use.

To understand the tradeoffs between cattle and hogs in competing for corn, the parameters in Table 4.1 were used to construct an isoquant, or production possibility frontier (PPF) representing alternative combinations of cattle and hog production that exhausted all available indigenous corn. This allowed historic levels of cattle and hog marketings to be compared with levels based solely on indigenous corn. Finally, the implied level of cattle and hog production feasible with average net imports plus Ontario corn production over the period was also evaluated.

### 4.3 Results

Based on the above approach, the following results were obtained. Over the 2003-06 period, Ontario corn production averaged about 5.7 tonnes, as shown in Table 4.2 below. Food and industrial use of corn averaged 2.15 million tonnes, and the implied consumption by supply managed livestock is about 1.4 million tonnes. This leaves about 2.13 million tonnes of corn for cattle and hog feeding. Including net imports and

**Table 4.2 Implied Corn Use by Category**

	<b>Indigenous Ontario Corn (tonnes)</b>	<b>Ontario Corn Plus Net Imports (tonnes)</b>
Production	5,705,542	7,254,258
Food and Industrial	2,151,250	2,151,250
Feed- Supply Management	1,423,778	1,423,778
Available to Feed Cattle and Hogs	2,130,515	3,679,230

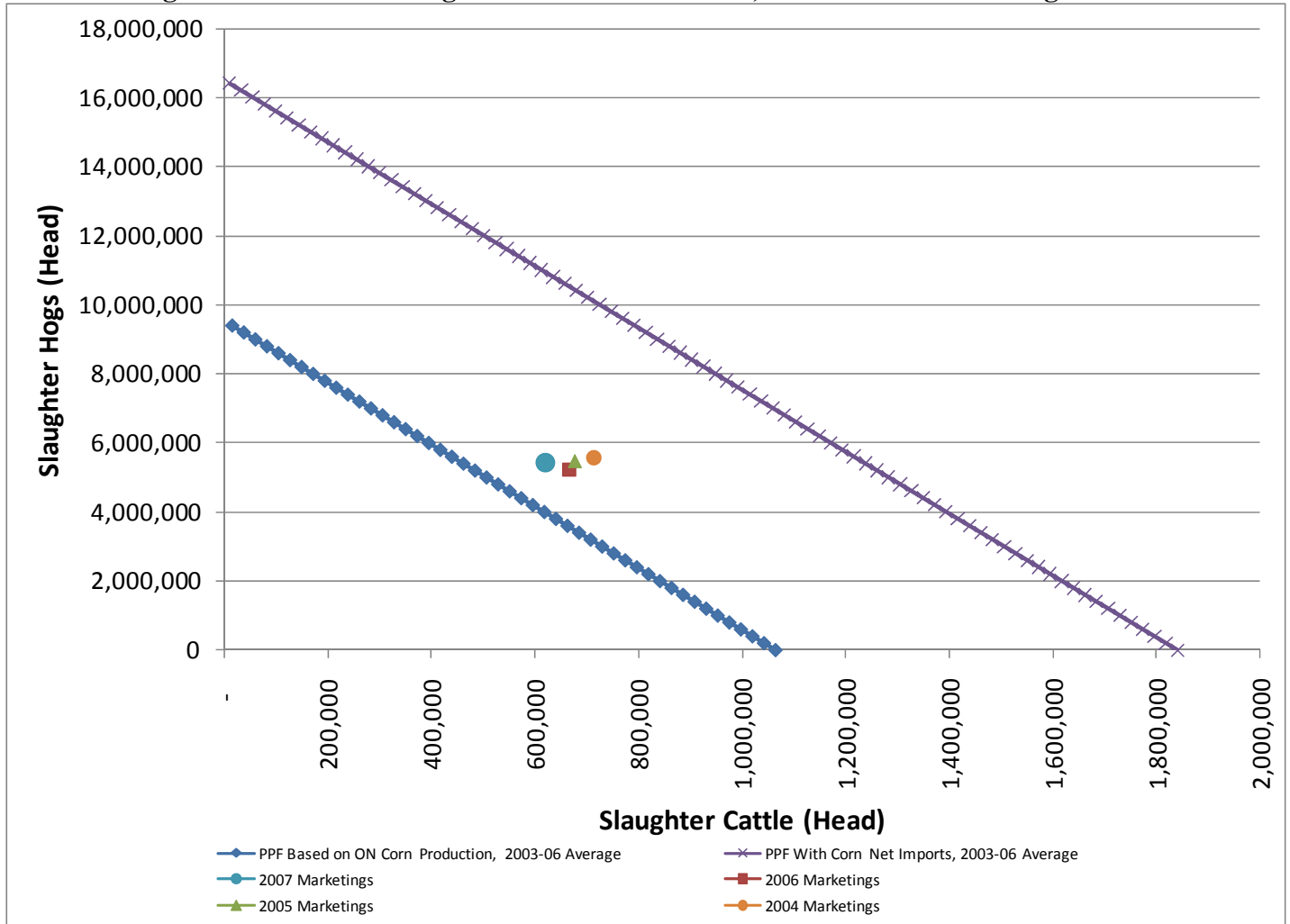
assuming that the additional supply due to imports could be entirely allocated to cattle and hog feeding, about 3.7 million tonnes of corn would be available.

Given the estimates of corn available to cattle and hog feeding, feasible combinations of cattle and hog production that would exhaust the available corn were calculated and presented as the PPF in Figure 4.1 below. The figure shows that, for example, based on indigenous corn, Ontario could produce just fewer than 9.6 million hogs and no fed cattle, or 1.065 million fed cattle and no hogs, or 530,000 head of fed cattle and 4.8 million hogs, and linear combinations of the above. If it is assumed that corn from net imports could be allocated to cattle and hogs, the PPF shifts out significantly

Also presented in the figure are Ontario cattle and hog marketings in 2004, 2005, 2006, and 2007. They show that marketings of hogs and cattle consumed substantially more corn than the indigenous corn supply could support. For example, in 2007, cattle marketings were 621,537 head, and hog marketings were 5,429,697 head. One way to interpret the extent to which this exceeded the capacity of the indigenous supply is to alternatively hold cattle production constant and observe the required reduction in hog marketings to return to the indigenous corn capacity, or alternatively to hold the hog marketings constant and reduce the number of cattle marketings. If cattle marketings were to be held constant, the indigenous corn capacity implies that only about 4 million hogs could be marketed, a reduction of about 1.4 million from actual 2007 hog marketings. Conversely, if hog marketings were held constant, cattle marketings would need to be reduced to about 460,000 head, a decrease of about 160,000 head. A linear combination in terms of reduced marketings of hogs and/or cattle would also meet the indigenous corn constraint.

Finally, the production possibilities when imported corn is included far exceed actual demand from hogs and cattle. This validates that corn consumption implied by the parameters in Table 4.1 was feasible. The reason for the significant excess availability of corn with net imports over actual cattle and hog feed consumption are many minor species feed use, steady state inventory, or movement of corn (imported or indigenous) to other provinces.

**Figure 4.1 Cattle and Hog Production Possibilities, and Historic Marketings**



## **5. Conclusions**

The purpose of this paper was to understand how the Ontario red meat-livestock segment got to the difficult position it finds itself in today. The discussion above roots the development of the cattle and hog segments in the development of Ontario corn production, and suggests that the two are intrinsically linked. There are other factors that have influenced development to today's cattle and hog segments in Ontario like the move to an export basis for livestock, BSE, the exchange rate, poor productivity in processing, but it is argued here that, in effect, the corn-livestock relationship is the most significant.

Furthermore, it suggests that the availability of Ontario corn to feed cattle and hogs effectively limits the sustainable size of cattle and hog marketings. The findings suggest that rather harsh adjustments are necessary to achieve a corn-cattle-hog balance that would restore the red meat livestock segment to its competitive base.

To some, the protracted analysis of the allocation of corn across consuming segments is redundant, because this is precisely what markets do. In other words, when Ontario started to run out of indigenous corn to feed to cattle and hogs and began to import corn, the import price basis for corn should have created the incentive to reduce cattle and hog marketings. In effect, this did not happen- cattle marketings decreased, but marketings occurred at much heavier weights that precluded corn silage finishing, which probably increased the total corn consumption by beef cattle. Clearly this adjustment did not happen in hogs- marketings increased, and the marketings were at increased carcass weights.

Why did the market fail to communicate the message to reduce cattle and hog production? A number of explanations are possible. The first is that the very weak Canadian dollar of the late 1990's and early 2000's had the effect of exaggerating livestock producers' revenue base for cattle and hogs to the extent that as the corn basis strengthened to an import basis, it was of minor significance and was disregarded. The second is that, to a large (but declining) extent, corn is transferred on-farm in livestock operations, and the opportunity cost presented by the increased corn basis was not perceived by cattle and hog producers. Third, particularly in the period following the 2002 US Farm Bill, corn prices throughout North America were very low and Ontario corn producers were having great difficulty meeting their costs of production by producing corn. Generally low prices everywhere may have masked the significance of the import basis for corn to Ontario livestock producers. Finally, after investments in livestock production assets have been made, producers are loath to idle them, even when profitability conditions badly worsen.

Whatever the confusion that has resulted, there are too many hogs and cattle are currently being marketed compared to the corn base. The following alternatives are apparent to remedy the situation:

- Cattle and hog production be decreased to a level consistent with indigenous corn production

- Corn available for cattle and hog feeding in Ontario be increased via increased Ontario corn production.
- Ontario and Canadian governments reverse policies for ethanol production to free up corn to sustain livestock and meat production
- Establish a means of differentiating Ontario livestock and meats such that structural disadvantages on input and output pricing can be offset.

The reduction of the livestock production is already occurring with a sow cull program that has an objective to cull 10% of Ontario's about 400,000 sows. Anecdotally, skyrocketing corn prices may be convincing some Ontario feedlot and swine operators (or their bankers) to leave their facilities empty. The Ontario Corn Fed Beef and Berkshire Pork initiatives are examples of differentiation initiatives already in existence today, but it must be acknowledged that differentiation is becoming the new mantra of uncompetitive industries, and marketing to niches is very challenging. A burgeoning ethanol sector is expected to consume significantly more corn in the near future, which, even after considering the distillers dried grains (DDG) released for livestock from ethanol production, will leave less corn or corn equivalent for cattle and hog feeding<sup>2</sup>. As fertilizer and fuel prices increase, there is also a renewed incentive to reduce corn acreage in favour of other crops that require less fertilizer and energy.

Thus, while the mechanics of adjustment appear somewhat basic, in practice the future of corn, and cattle and hog feeding segments in Ontario is uncertain.

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<sup>2</sup> For example, Mussell et al assume a maximum DDG inclusion rate in hog and beef finishing rations of 20%, based on the animal nutrition literature. Corn can be used at a much higher inclusion rates



## **References**

Mussell, Al, Anatoliy Oginsky, and Kate Stiefelmeyer. *Status and Competitive Impacts of Ethanol Development on Canadian Livestock Industries*. George Morris Centre Special Report, October, 2007.