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Canadian Agriculture and Food
A Growing Hunger for Change

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Sector in decline or industry of the future?

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Executive Summary

Introduction

More food will be eaten over the next half century than has been eaten by human beings since the dawn of history. The combination of increasing population and incomes, decreasing poverty, and increased non-food use for many food staples (e.g. bio-fuels) has resulted in an explosion of food demand for the foreseeable future. Indeed, by almost every measure the world will transition to a period of food shortages rather than the surpluses that have characterized recent history.

Canada should be poised to capitalize on this opportunity to feed the world. We are uniquely positioned due to our vast tracts of arable land, abundant water, infrastructure, and long experience in the sector. These advantages should result in more and better employment, investment, and opportunities.

And yet despite this unprecedented opportunity for Canada to again become a global food superpower, the Canadian agriculture and agri-food business is not even keeping pace. Our share of world markets is falling, not rising, our agricultural productivity is falling, not rising, our influence in world trade talks about agriculture is falling, not rising. As a result, our rural communities are foregoing greater prosperity, our food processors are losing out on export opportunities and our economy is missing out on potential growth. That is a missed opportunity for Canada. But it is also far more: at a moment when it is not clear that the world can meet the growing demand for food, it is a potential humanitarian tragedy for the globe. Canada faces both an economic and a moral imperative to do better.

This paper argues that the solution is largely in the hands of Canadians and their governments. Policymakers in particular must face up to the fact that this country's laws and regulations are sadly out of date, reflecting a mistaken belief that agriculture and food processing are industries of the past, not the future. Canada's potential as a food superpower can yet be unleashed by removing the barriers erected by poor policy. This paper lays out a high level strategy to achieve just that.

Future Demand for Food – A Fundamental Shift

Demand for food has been growing at a rapid pace and, assuming incomes in developing countries continue to rise at rates consistent with the past two decades, it is clear that demand will continue to grow almost geometrically in the near future. Estimates are that the demand for food will double by 2050. Most of the growth in demand will be in developing countries because of both population and income growth in those regions. Indeed, we have witnessed the largest migration of people out of poverty in human history over the last two decades.

Demand for food will not grow materially in developed countries because incomes are already high and so is consumption. The major components of demand growth in the developing countries will be livestock products, fats and oils, and fresh horticultural products. By implication this also means that there will be substantial growth in demand for feed grains and oilseeds.

The growth in demand for food will be exacerbated by demand for energy. Current policy in some developed countries creates markets for grains and oilseeds to be used to produce bio-fuels. This could change if there is a change in policy or if there are scientific breakthroughs in finding efficient new sources of energy. At this point, neither appears to be on the horizon. However, we appear to be entering a fundamental shift toward increased energy demand. Many of the alternatives being considered as sources of energy in the future rely on molecules from food products or their substitutes. Therefore, it is highly likely that the food/fuel tension will continue into the foreseeable future.

These two factors combined mean a very different marketplace in the future, one that may continue to be characterized by shortages, rather than the surpluses of the past 60 years.

Canada's Opportunity

Canada has both natural and accumulated advantages offering an opportunity to become the premier supplier of agricultural and agri-food products to the world. Canada has the third largest endowment of arable land per capita in the world behind Australia and Kazakhstan. However, Australia's arable land is of relatively low quality due to poor access to water and Kazakhstan lacks infrastructure. Most of Canada's competitors have less than half the arable land per capita than we do.

Another advantage for Canada is the quality and health of our soil. Many of the world's soils have been badly degraded, including much of Asia and Africa where growth in food demand is occurring. These soils have lost quality, productivity, and utility due to erosion, desertification, and/or significant use of chemicals instead of organic matter to try to improve productivity. Canada has some of the most stable soils in the world, which constitutes another significant advantage for our country.

A final natural advantage for Canada is our access to water. Much of the world faces some degree of fresh water scarcity. Like soil degradation, many of the areas in the world facing severe water scarcity are also the areas with enormous growth in food demand. Canada is one of the few nations on the earth not to experience water shortages. Canada contains approximately 9 percent of the world's renewable freshwater supply and our use of renewable water resources (as a percent of total resources) is very low compared to our competitors.

In addition to these natural advantages, Canada also possesses two accumulated advantages. The first is infrastructure. In a comparative sense, it is much easier for Canadians to deliver their products to markets than many of our potential competitors. In addition, Canada maintains a recognized scientific and research-based infrastructure to support the industry. The second accumulated advantage is our long history and experience with the industry. Indeed, agriculture is one of the founding industries of the nation.

Canada's Performance To-Date

Against this potentially dramatic increase in future demand for food Canada stands as a country that could gain materially. However, Canada has lost market share. Our analysis shows that Canada is losing market share in every major product except pulses. The loss in market share is both at the farm level and in food manufacturing.

Underlying the loss in market shares is lagging productivity in Canada's agriculture and food sector. This is true for both primary agriculture as well as food processing. The data show that by all measures, Canada lags the United States in multifactor productivity at the primary level and in labour productivity at the food processing level.

Explaining Canada's Poor Performance

Part of the reason for lagging productivity in manufacturing is the nature of Canada: its geographic size and distribution of the relatively small population means that distribution costs are high and that it is difficult to achieve economies of size. Moreover, the sector has additional risk because of currency fluctuations.

However, there is also considerable evidence that productivity lags because of reasons internal to Canada that have nothing to do with its geography. It is important to point out that "labour productivity" is highly linked with capital investment: labour productivity rises when workers have automation, and when workers work in plants that have economies of size. Our analysis of investment shows that in the food manufacturing industry over the past decade there has been less new investment than capital depreciation. This is tantamount to disinvestment. It is therefore not surprising that there have been few gains in productivity.

Reform Path to Prosperity

Several factors appear to contribute to Canada's poor performance, which can be changed through government leadership and reform:

- **The Regulatory System.** Canada's regulatory system is slow, cumbersome, and inefficient. It discourages the adoption of new technologies at the farm level and in food processing. It discourages food companies from developing new products that can provide health and other benefits to consumers. As a result, it removes the opportunity for farmers and food companies to differentiate their products. It is, in a word, an oppressive blanket on innovation in the food sector that not only discourages investment, but drives it out of the country and it removes any opportunity for Canada to be an early adopter of technology in any area. It should be the subject for immediate and substantial reform aimed at simultaneously providing healthy products to Canadians and encouraging innovation and efficiency in the food supply system.
- **Agricultural Policy.** Canadian governments spend over 70 percent of their budgets on farm income support. When one adds in the economic benefit to the dairy and poultry industries resulting from supply management, price and income support represents roughly 90 percent of total government agricultural and food policy. In total, according to the OECD, Canada's market support for agriculture remains between 20 and 25 percent of gross farm income on average year in and year out. Other countries have transformed their policies, either to reduce market support below 10 percent, as in Australia and New Zealand, or have begun to replace market support with policies aimed at improving productivity and the environment. While Canada's market support is nowhere near the highest proportion of total producer returns among OECD countries, the most recent data indicate it is the only country that is not changing the nature of its policies. The Canadian economy could benefit from reform to the current policy. Canada's agri-food policy, like that of most other developed countries, is a product of six decades of surplus. If continued prosperity occurs and the more likely prospect is scarcity in the future, then it is more than time to rethink our policy structure. This is especially so for a country whose agriculture and food sector relies heavily on export markets and would benefit from orderly expansion of export markets in the future.
- **Preoccupation with Small Operations.** Both inside agricultural policy and outside, many programs, sometimes with direct government investment, aim to increase the number of small operations. This reduces our competitive advantage and directly and indirectly reduces the amount of capital available for investment. For example, there were 100,000 farms in Canada (2004-2008) with sales of less than $100,000 per year that represented 55 percent of the total number of farms, generated only 5.7 percent of net operating income but collected 16.2 percent of support payments from government. These farms also had about $4.2 billion in income from other sources (non-farm). While a few of these operations may be legitimate farms, very few of them contribute much to the economy.
- **International Trade Policy.** Canada suffers from serious tariff and non-tariff barriers in accessing markets that demand Canadian products. In other words, there are markets where consumers demand products made in Canada but which Canadian firms have trouble accessing because of trade barriers. Nothing illustrates the importance of market access better than the example shown below of the Canadian pork industry. Millions of dollars in public funds were invested in a money-losing industry during the past five years that declined by about 20 percent, even as demand for its products was dramatically increasing in much of the rest of the world. Expanded and secure market access is the solution for not only Canada's pork industry but the entirety of the agriculture and agri-food sector.

Conclusion

Canada enjoys natural advantages, maintains strategic resources, and has an outstanding reputation as a reliable supplier of high-quality products, which positions us more favourably than almost any other country to capitalize on the growth in food demand. However, our current faltering performance is rapidly turning us into a backwater at the very time the world could benefit from our leadership. Canada desperately needs to develop a cogent and logical domestic and international trade strategy for its food industry as outlined above and detailed in this study.

Sommaire

Introduction

Les êtres humains consommeront plus de nourriture au cours du prochain demi-siècle que depuis le début de l'Histoire. L'effet combiné d'une population et de revenus croissants, d'une pauvreté déclinante et d'une utilisation accrue de plusieurs aliments de base à des fins non alimentaires (les bioénergies par exemple) a entraîné une explosion de la demande pour la nourriture dans un avenir prévisible. Selon toutes les mesures, le monde entreprend en effet une transition vers une période de pénuries de nourriture, par opposition aux surplus qui ont caractérisé l'histoire récente.

Le Canada devrait être bien positionné pour profiter de cette opportunité de nourrir le monde. Nous sommes dans une situation unique à cause de nos vastes espaces de terre arable, notre eau abondante, nos infrastructures et notre longue expérience dans ce secteur. Ces avantages devraient normalement se concrétiser dans des emplois plus nombreux et de qualité, plus d'investissements et plus d'opportunités d'affaire.

Et pourtant, malgré cette occasion pour le Canada de reprendre sa place en tant que superpuissance alimentaire, l'agriculture et l'industrie agro-alimentaire canadiennes ne peuvent même pas tenir le rythme. Notre part des marchés mondiaux diminue au lieu d'augmenter, notre productivité agricole chute au lieu de croître, notre influence au sein des pourparlers concernant l'agriculture dans les négociations commerciales internationales s'amenuise au lieu de grandir. Il en résulte que nos communautés rurales laissent passer une prospérité plus grande, nos usines de transformation alimentaire perdent des opportunités d'affaire et notre économie laisse filer une croissance potentielle. Tout cela constitue une opportunité manquée pour le Canada. Mais il y a pire : à un moment où on ne sait pas si le monde pourra répondre à la demande de nourriture, cela signifie une tragédie humanitaire pour la planète. Le Canada doit, pour des raisons économiques et morales, absolument faire mieux.

La présente étude soutient que la solution se trouve principalement entre les mains des Canadiens et de leurs gouvernements. Les décideurs politiques en particulier doivent admettre que les lois et règlementations de ce pays sont malheureusement désuètes, reflétant ainsi une fausse croyance selon laquelle l'agriculture et la transformation alimentaire sont des industries du passé, et non de l'avenir. Le potentiel du Canada en tant que superpuissance alimentaire peut toutefois encore être libéré si l'on enlève les barrières érigées par de mauvaises politiques. Cette étude propose une stratégie de haut niveau pour y parvenir.

Un virage fondamental dans la demande à venir pour la nourriture

La demande pour la nourriture augmente à un rythme très soutenu depuis un certain temps et, en présumant que les revenus continueront de croître à un taux semblable à celui des deux dernières décennies dans les pays en développement, il est tout à fait clair que la demande dans ces pays progressera de façon quasi exponentielle dans un avenir proche. On estime que la demande pour la nourriture doublera d'ici 2050. La croissance de la demande surviendra principalement dans les pays en développement, à la fois parce que la population et les revenus augmentent dans ces régions. Depuis deux décennies, nous avons en effet été témoins du plus important mouvement de population hors de la pauvreté dans l'histoire humaine.

La demande pour la nourriture n'augmentera pas de façon notable dans les pays développés parce que les revenus, de même que la consommation, y sont déjà élevés. Les principales composantes de cette croissance de la demande dans les pays en développement seront la viande d'élevage, les graisses et huiles ainsi que les produits horticoles frais. Par voie de conséquence, cela signifie également qu'on assistera à une croissance substantielle de la demande pour les céréales animalières et pour les graines oléagineuses.

La demande pour l'énergie rendra plus difficile la croissance de la demande pour la nourriture. Certains pays en développement ont présentement des politiques visant à créer des marchés pour les céréales et les huiles oléagineuses utilisées dans la production de bioénergies. Ceci pourrait changer si ces politiques sont modifiées ou si des découvertes scientifiques surviennent dans la recherche de nouvelles sources d'énergie plus efficaces. Pour le moment, aucun de ces scénarios n'apparaît à l'horizon. Nous semblons toutefois entrer dans une période de changements fondamentaux où la demande d'énergie augmentera. Plusieurs des sources d'énergie considérées comme des solutions de rechange dans l'avenir nécessitent des molécules tirées de produits alimentaires ou de leurs substituts. Il est donc très probable que les tensions entre la production de nourriture et la production d'énergie continuent d'exister dans un avenir prévisible.

Ces deux facteurs combinés feront en sorte de créer un marché très différent, qui pourrait être caractérisé par des pénuries plutôt que par des surplus comme au cours des 60 dernières années.

Une occasion pour le Canada

Le Canada possède à la fois des avantages naturels et des avantages accumulés qui lui offrent l'occasion de devenir le principal fournisseur de produits agricoles et agro-alimentaires au monde. Nous avons la troisième plus importante quantité de terres arables per capita dans le monde, derrière l'Australie et le Kazakhstan. Les terres de l'Australie sont toutefois d'une relative mauvaise qualité à cause d'un accès difficile à l'eau, alors que le Kazakhstan n'a pas les infrastructures requises. La plupart des concurrents du Canada ont moins de la moitié des terres arables per capita que nous possédons.

Un autre avantage pour le Canada est la qualité et la santé de notre sol. Une bonne partie des sols de la planète ont été sérieusement dégradées, y compris dans la plupart des régions d'Asie et d'Afrique où l'on observe une croissance de la demande de nourriture. Ces sols ont perdu en qualité, en productivité et en utilité à cause de l'érosion, de la désertification et/ou à cause d'une utilisation importante de produits chimiques plutôt que biologiques pour améliorer la productivité. Le Canada a l'un des sols les plus stables de la planète, ce qui constitue un autre avantage significatif pour notre pays.

Nos abondantes ressources hydriques procurent un dernier avantage au Canada. L'eau douce est une ressource rare à divers degrés dans la plupart des régions du monde. Tout comme c'est le cas pour la dégradation des sols, plusieurs des régions qui sont confrontées aux pénuries les plus graves sont également celles qui connaissent une croissance énorme de la demande pour la nourriture. Le Canada est l'un des rares pays au monde qui ne connaît pas de pénurie d'eau. Environ 9% des ressources mondiale d'eau douce renouvelable se retrouvent au Canada et notre utilisation de ces ressources (en proportion du total) est très faible comparée à nos concurrents.

En plus de ces avantages naturels, le Canada possède deux avantages accumulés. Le premier est celui des infrastructures. D'un point de vue comparatif, il est beaucoup plus facile pour les Canadiens de livrer leurs produits aux marchés que ce ne l'est pour plusieurs de nos concurrents potentiels. De plus, le Canada entretient une infrastructure scientifique et de recherche reconnue visant à appuyer l'industrie. Le second avantage accumulé est notre longue histoire et notre expérience dans cette industrie. L'agriculture est en effet l'une des industries fondatrices du pays.

La performance du Canada jusqu'à maintenant

Dans le contexte de cette augmentation potentiellement vertigineuse de la demande pour la nourriture, le Canada est l'un des pays qui pourraient obtenir des gains appréciables. Notre analyse montre toutefois que le Canada perd des parts de marché dans toutes les principales classes de produits sauf les légumineuses. Cette perte de parts de marché se concrétise autant au niveau de la ferme que dans la transformation des aliments.

Les causes de cette perte de marchés sont la productivité retardataire de l'agriculture et de la production alimentaire canadiennes. Les données indiquent que selon toutes les mesures, le Canada traîne derrière les États-Unis sur le plan de la productivité multifactorielle dans le secteur primaire et de la productivité du travail dans le secteur de la transformation alimentaire.

Les causes de la mauvaise performance canadienne

Le retard qu'a pris la productivité dans le secteur de la transformation alimentaire au Canada est en partie dû à la nature du pays : sa taille géographique et la distribution de sa population relativement faible signifient que les coûts de distribution sont élevés et qu'il est difficile de réaliser des économies d'échelle. De plus, le secteur connaît des risques additionnels dus aux fluctuations des devises.

Il existe toutefois aussi des indications claires qui montrent que la productivité tire de l'arrière pour des raisons spécifiques au Canada qui n'ont rien à voir avec la géographie. Il faut bien comprendre que la « productivité du travail » est fortement corrélée avec les investissements en biens de capital : la productivité du travail augmente lorsque les travailleurs disposent d'équipements automatisés et lorsqu'ils travaillent dans des usines qui bénéficient d'économies d'échelle. Notre analyse des investissements montrent que dans l'industrie de la transformation des aliments, les nouveaux investissements n'ont pas compensé la dépréciation du capital au cours de la dernière décennie. Cela équivaut à un désinvestissement. Il n'est donc pas surprenant d'y retrouver peu de gains de productivité.

Une voie réformatrice vers la prospérité

Plusieurs facteurs semblent contribuer à la performance médiocre du Canada, qu'un leadership et des réformes de la part des gouvernements permettraient de changer :

- **Le système réglementaire.** Le système réglementaire canadien est lent, lourd et inefficace. Il décourage l'adoption de nouvelles technologies par les exploitants agricoles et dans la transformation des aliments. Il désincite les entreprises du secteur agro-alimentaire à développer de nouveaux produits offrant aux consommateurs des bienfaits sur leur santé ou sur d'autres plans. À cause de cela, il enlève aux fermiers et aux entreprises de transformation alimentaire l'opportunité de différencier leurs produits. En un mot, ce système est un obstacle à l'innovation dans le secteur agro-alimentaire qui non seulement décourage les investissements, mais les fait fuir à l'extérieur du pays et détruit toute possibilité pour le Canada de compter parmi les premiers pays à adopter une nouvelle technologie dans quelque domaine que ce soit. Ce système devrait être réformé immédiatement et en profondeur avec l'objectif de fournir aux Canadien des produits bons pour la santé tout en encourageant l'innovation et l'efficacité dans le secteur de la distribution alimentaire.

- **Les politiques agricoles.** Les gouvernements au Canada dépensent plus de 70% de leurs budgets dans le domaine des politiques agricoles sur le soutien au revenu des agriculteurs. Lorsqu'on ajoute à cela les avantages économiques qu'obtiennent les secteurs du lait et de la volaille par l'entremise de la gestion de l'offre, le soutien aux prix et aux revenus représente environ 90% des dépenses totales des gouvernements en matière de politiques agricoles et alimentaires. Selon l'OCDE, les mesures de soutien du marché agricole représentent d'année en année entre 20 et 25% du revenu brut de l'exploitation agricole. D'autres pays ont transformé leurs politiques, en réduisant par exemple le soutien du marché sous la barre des 10%, comme en Australie et en Nouvelle-Zélande, ou ont entrepris de remplacer les mesures de soutien du marché par des politiques visant à améliorer la productivité et l'environnement. Bien que les mesures canadiennes de soutien du marché soient loin d'atteindre les proportions les plus élevées de revenu total des agriculteurs parmi les pays de l'OCDE, les plus récentes données indiquent que nous sommes le seul pays qui n'a pas entrepris de modifier la nature de ses politiques. L'économie canadienne pourrait bénéficier d'une réforme des politiques actuelles. La politique agro-alimentaire du Canada, comme celle de la plupart des pays développés, est le produit de six décennies de surplus. Si la prospérité se poursuit et que la perspective la plus probable est celle de pénuries dans l'avenir, il est alors plus que temps de repenser la structure de nos politiques.Ceci est particulièrement le cas pour un pays dont l'agriculture et l'industrie de transformation alimentaire dépendent grandement des marchés d'exportation et profiteraient d'une expansion ordonnée de ces marchés dans l'avenir.

- **Une préoccupation envers les opérations modestes.** Autant au sein de la politique agricole que dans d'autres secteurs, de nombreux programmes visent à accroître le nombre de petites opérations, souvent avec des investissements publics directs. Ceci a pour effet de réduire notre avantage concurrentiel et de réduire directement et indirectement la quantité de capital disponible pour les investissements. Par exemple, il y avait 100 000 fermes au Canada (2004-2008) avec des ventes de moins de 100 000 $ par année qui représentaient 55 % du nombre total des fermes, généraient seulement 5,7 % des revenus nets d'opération mais récoltaient 16,2 % des montants de soutien en provenance des gouvernements. Ces fermes obtenaient également environ 4,2 milliards de dollars en revenus d'autres sources (non agricoles). Bien que certaines de ces opérations puissent être légitimement considérées comme des fermes, très peu d'entre elles contribuent vraiment à l'économie.
- **La politique commerciale internationale.** Le Canada souffre de la présence de nombreuses barrières tarifaires et non tarifaires qui l'empêchent d'accéder à des marchés qui réclament des produits canadiens. En d'autres termes, il existe des marchés où les consommateurs veulent des produits fabriqués au Canada mais auxquels les entreprises canadiennes ont de la difficulté à accéder à cause de barrières commerciales. Rien n'illustre davantage l'importance d'un accès aux marchés que l'exemple donné dans le présent document de l'industrie porcine canadienne. Des millions de dollars en fonds publics ont été investis au cours des cinq dernières années dans une industrie déficitaire qui a rétréci d'environ 20%, alors même que la demande pour ses produits augmentait de façon spectaculaire dans une bonne partie du monde. Un meilleur accès plus sécuritaire à ces marchés serait non seulement une solution pour l'industrie canadienne du porc mais pour l'ensemble du secteur agricole et agro-alimentaire.

Le Canada jouit d'avantages naturels, possède des ressources stratégiques ainsi qu'une réputation impeccable en tant que fournisseur fiable de produits de haute qualité, ce qui nous place dans une position plus favorable que presque n'importe quel autre pays pour tirer profit de la croissance de la demande pour la nourriture. Notre performance médiocre est toutefois en voie de nous reléguer au rang de puissance négligeable au moment même où le monde pourrait bénéficier de notre leadership. Le Canada a désespérément besoin de développer une stratégie commerciale domestique et internationale pertinente et logique pour son industrie agro-alimentaire, comme nous l'avons décrit ci-haut et de façon plus détaillée dans l'étude.

Introduction[1]

When opinion leaders talk about the future of Canada's economy, they almost always refer to industries like telecommunications, banking, automobiles, energy, or minerals. Food and agriculture are seldom the focus, even though foodstuffs represent the second largest manufacturing sector in the country's economy. World demand and international trade in agricultural products are growing geometrically, and Canada possesses a fabulous endowment of land and water that uniquely position us to exploit those trends. Never has the potential for Canadian agriculture been greater.

Yet in many commodity categories, and in most processed products, Canada is losing international market share. Compared to other countries, productivity in our agri-food sector appears to be falling behind. Why, in the face of such an apparent abundance of resources, is Canada's participation in the world marketplace shrinking?

World population will soon reach seven billion people, and their incomes are growing more rapidly than ever. In that context, Canada's agri-food sector should be a central and leading force for our own economic growth, not a backwater of the world food industry. But we have adopted both public and private policy sets that prevent us from reaching our potential, ones which may be obsolete in the modern market environment.

The discussion that follows has three specific objectives:

- To provide clarity on the nature and scope of current and future opportunities for Canada's agriculture and food sector. What will be demanded, how much and where?
- To provide concrete evidence of Canada's performance against these opportunities. What is happening to our market share in food sales and our productivity?
- To provide indications of the drivers of poor Canadian performance. What needs to change to improve it?

A central question about the demand for food and bio-fuel is whether recent increases in prices are part of a long-term or a short-term phenomenon. Grain prices have trended downwards for more than a century; perhaps the past few years merely represent a temporary blip. The answer is crucially important for strategic planning and investment in the agri-food sector. It is no less important for the development of good public policy. Many critics see our policies in the past 20 years as mostly short-term in nature, exercises in responding to "squeaky wheels" – especially around election time.

What are the underlying drivers of food demand, and how well are the world's food producers equipped to respond to the future trends? Can production continue to keep up with demand, as it has in the past? Does our country possess inherent advantages?

In the past, Canada has been a major agricultural exporter. Have we maintained our position or have we let it slip? If so, what are some potential reasons why Canada is falling behind? How have we performed in the face of a changing marketplace? What do we need to change if our performance is to improve, to allow the Canadian agriculture and food sector to reach its potential?

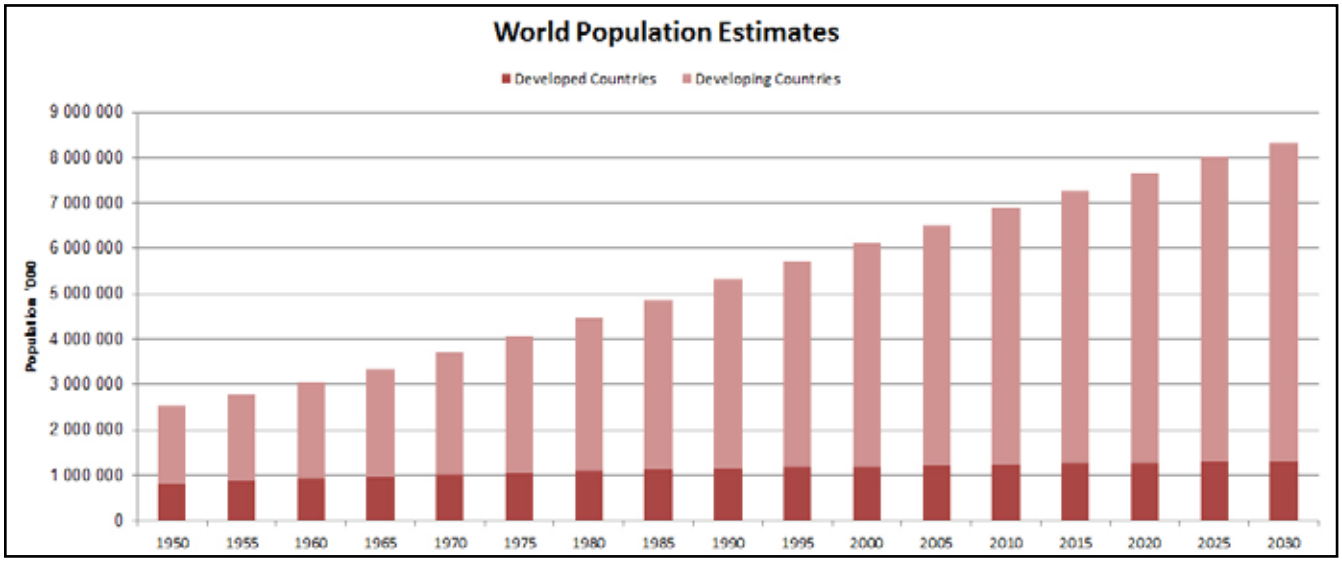
Global Food Demand: A Propellant for Canadian Growth

Demand for food is driven by population and incomes. The quantities demanded are affected by the distribution of population among age and income groups. Increasingly, the demand for food must compete with an emerging demand for grains and oilseeds dedicated to energy production, a fact that complicates both demand and our response in terms of future production. In addition, an increasing aspect of food demand is the fact that consumers with higher incomes can afford the luxury of paying extra for specific attributes.

The World's Growing Population

Earth's human population is growing rapidly. Figure 1 shows the world's actual and projected population to the year 2020. Many demographers project that it will grow from the current 6.9 billion to 9 billion or more in the next 25 to 30 years.[2]

Figure 1 World population



Source: United Nations World Population Prospects Data Base

Figure 1 also shows where the people are. The majority of the world's population lives in developing countries, essentially in Asia, Africa, and South America, and this is where growth will continue to occur. While birth rates and population growth rates are slowing everywhere, they have slowed the most in high-income countries, to the extent that populations are essentially in a steady state in those places. Virtually all future growth in population will be in developing countries.

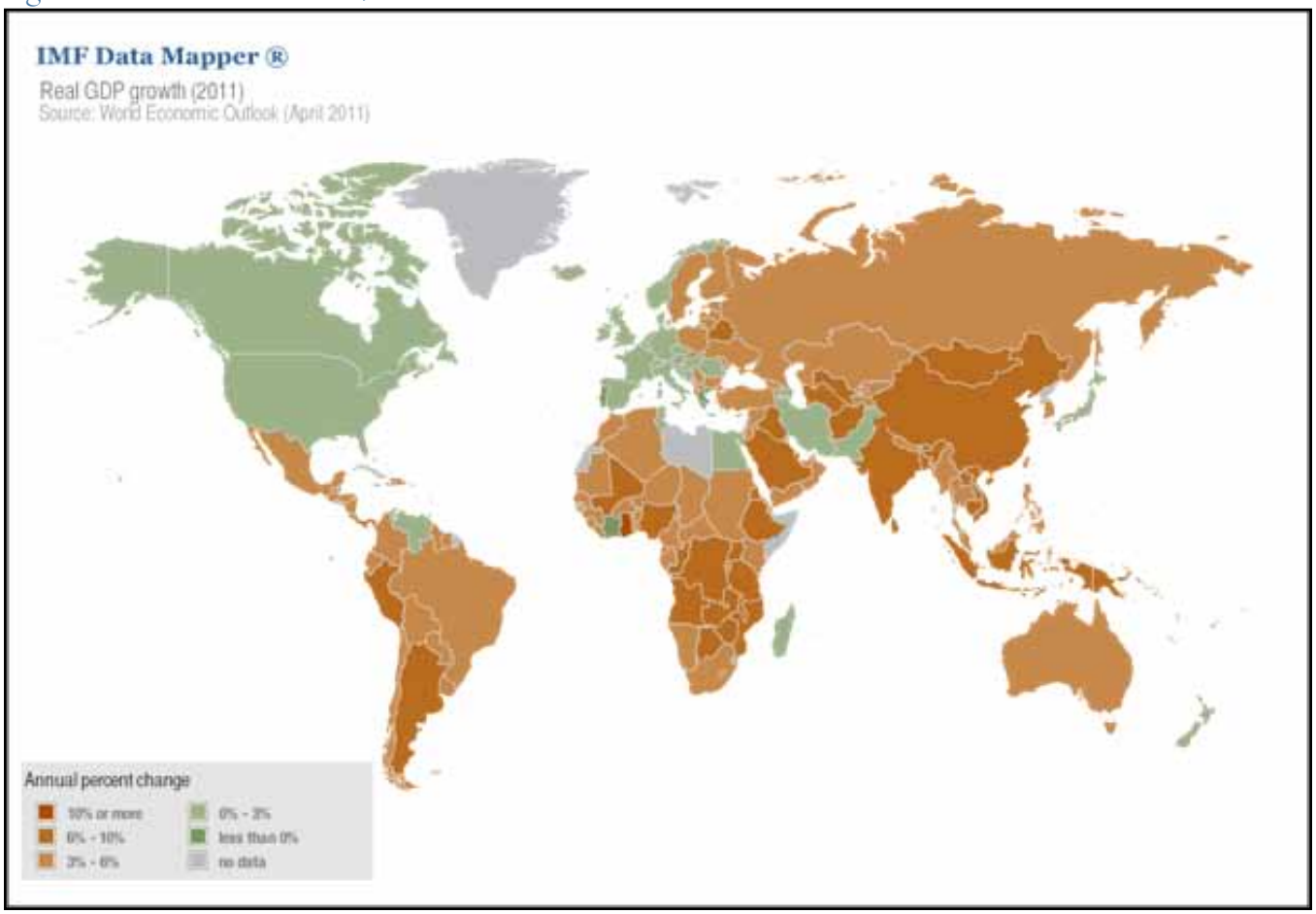
Clearly we have been experiencing rapid population growth for some time. In the 18th century, Thomas Malthus predicted a future of human misery because he did not believe that food productivity could keep up with population growth. So far, history shows Malthus to be wrong: new technology and better production practices have, in fact, led to 200 years of declining agricultural prices after adjusting for inflation.

What, if anything, is different now? Several factors are combining to produce what could be a very different trend for the future. The most important is that many more people have enough money to afford improved diets.

Income Growth and Its Effects on Food Demand

It's a dramatic difference: for the first time in history, more people in developing countries have more income. Figure 2 shows the growth in real (that is, deflated) GDP in 2011. Countries with income growth rates of more than five percent annually are in dark orange. Those with lower rates are in lighter orange and those with the lowest rates are green. Note that much of east and south Asia are dark orange, as is much of Africa. Those countries represent over three billion people, all potential consumers of Canadian food.

Figure 2 Real GDP Growth, 2011



Source: International Monetary Fund, World Economic Outlook

This growth is not just because of population. Real growth is taking place on a per capita basis. Real incomes have been growing in developing countries for almost two decades and the rate of growth in per capita incomes has been rising.

Table 1 contains average growth rates in real per capita GDP since 1990 for selected countries and regions. Quite clearly, the growth has been sustained: as a result more people have come out of poverty in the past two decades than at any time in human history.

Table 1 Average real per capital GDP growth rate 1990-2010

	1990-1994	1995-2001	002-2010
Developed	1.64%	2.65%	1.48%
Developing	-0.07%	2.16%	3.17%
South and East Asia	4.22%	5.93%	9.99%
India	2.32%	3.93%	6.75%
China	11.31%	7.62%	10.33%

Source: International Monetary Fund

Income growth contributes to changes in diets, especially when people move from having almost no income to a level more capable of sustaining their lives. Across history, we see evidence of this: when people with low incomes are able to earn more, they tend to spend a large portion on food. They upgrade their diets by consuming more protein, more fats and oils, and more fresh produce.

Kearny shows that world caloric intake has risen by increasing in developed countries, while remaining flat in developed countries. He then goes on to explain the dietary changes:

> "The marked rise in available food energy observed globally has been accompanied by changes in the composition of the diet. The process involved in such dietary change appears to follow a pattern involving two main stages. In the first stage, known as the 'expansion' effect, the main change is in terms of increased energy supplies, with these extra calories coming from cheaper foodstuffs of vegetable origin (cereals, roots, tubers). This development has been ubiquitous, occurring in both developed and developing countries. The second stage, called the 'substitution' effect, results in a shift in the consumption of foodstuffs with no major change in the overall energy supply. This shift is primarily from carbohydrate-rich staples (cereals, roots, tubers) to vegetable oils, animal products (meat and dairy foods) and sugar. In contrast to the first stage, this one is country-specific and is influenced by culture, beliefs and religious traditions. In particular, such traditions can influence the extent to which animal products substitute vegetable products and the specific types of meat and animal products consumed."

To illustrate this Table 2 contains per capita urban consumption of various products in China across various income groups. In this example, vegetable oil consumption levels off across income levels fairly quickly, but the remaining products rise across all income levels.

Table 2 Food consumption (in kilograms) per capita in urban China by income group, 1998

	Income Groups						
Products	Lowest	Low	Lower middle	Middle	Upper Middle	High	Highest
Vegetable oil	7.12	7.68	7.67	7.67	7.45	7.59	7.58
Port	12.43	13.96	14.98	16.12	17.16	18.32	19.05
Beef	1.48	1.76	1.97	2.14	2.3	2.52	2.61
Poultry	3.13	3.86	4.31	4.8	5.08	5.77	5.98
Eggs	8.25	9.1	10.03	10.22	10.63	11.18	12.01
Fish	3.03	3.5	3.85	4.19	4.45	4.82	5.08
Shrimp	0.68	0.81	0.93	1.05	1.14	1.31	1.48
Vegetables	97.82	104.5	108.78	114.15	118.25	126.24	134.78
Sugar	1.54	1.71	1.73	1.78	1.77	1.86	1.99
Dairy	2.87	3.72	4.95	6.17	7.48	9.03	10.66
Melons and Fruits	31.2	39.11	43.52	48.83	53.96	58.87	63.37
Beer	3.75	4.87	5.81	6.47	7.31	8.14	8.13

Source: Wang, Shi and Zheng, 2000.

This phenomenon has major global implications. If incomes in developing countries continue to rise as they have in the past, then demand for these types of products will continue to rise markedly. For example, Table 3 shows growth in world meat consumption since 1975.

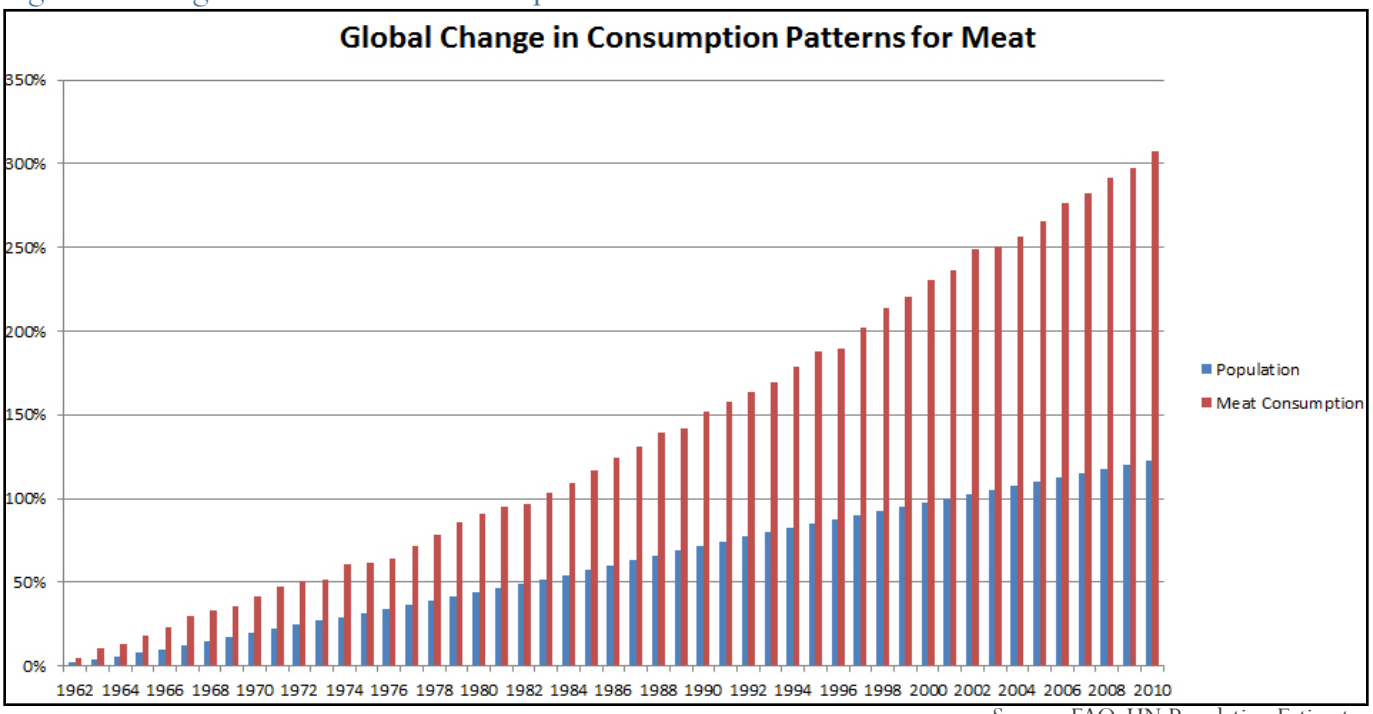
Table 3 World meat consumption

Year	1975	1980	1985	1990	1995	2000	2005	2006	2007
World Meat Consumption ('000 Tonnes)	114,900	135,675	153,724	178,785	204,275	232,322	258,208	264,408	268,875

Source: FAO

Given that per capita meat consumption in developed countries is flat or declining, as is their population, almost all of the growth in meat consumption has occurred in the developing countries. The income effect on dietary variety has had and will continue to have a very substantial effect on consumption patterns. Figure 3 shows that more than half the growth in world meat consumption was due to income growth, not to population growth.

Figure 3 Change in world meat consumption since 1960



Source: FAO, UN Population Estimates

Further, what are the eventual consequences on food demand of rising incomes in developing countries? The corollary of what's discussed above – i.e., what happens to food demand as low-income people earn more income – is that at higher levels of income only a small portion of increased income is spent on food. So, is there a likelihood that demand growth will taper off in the next few years if incomes continue to grow?

Work by Robert Thompson[3] at the University of Illinois can help answer that question. It shows that people can subsist – i.e., have enough calories to live – on traditional diets when per capita incomes are $2 per day, or about $3000 per year for a family of six. Above that, the level of income allows people to diversify their diets into the kinds of products discussed earlier, more animal products, fats and oils, and fresh produce. When incomes rise above $10 per day, people become secure enough to spend less of the increasing total on food.

For a number of developing countries, Table 4 shows their total population and the portion of it with incomes under $2 per day in 2005.[4] For most of these countries, the majority of the population's income remains below the $2 per day level; the data suggest there are approximately 2.6 billion people in the world in that category.[5] The largest migration of people out of poverty in human history has occurred over the past decade. As prosperity continues to grow in the developing world, many more people will be able to enrich their diets.

Table 4 Population and income of selected countries

Country	Population (Millions)	%<$1.25/day	%<$2/day
China	1,303.7	15.9	36.3
India	1,094.6	21.4	75.6
Indonesia	219.2	21.4	53.8
Brazil	186.1	7.76	18.3
Pakistan	155.8	22.6	60.3
Russia	143.2	0.16	1.49
Bangladesh	153.1	49.6	81.3

Nigeria	140.9	64.4	83.9
Mexico	103.1	4.1	11.0

Source: World Bank

The consequences for future food production are clear. Forecasts that combine the income and population effects predict as much as a doubling of food consumption by 2050.[6] In other words, more food will be required in the next 40 years than has been consumed in the whole of human history.

Another implication is that increased demand will draw substantially on the world's resources. Livestock require grain and forage. Grain and forage production require land (although livestock that digest forage can use the world's vast grasslands without the environmental degradation that may occur when they are plowed). All of these commodities require substantial amounts of water. Growing crops or rebuilding soils requires either chemical or organic fertilizers. We will address the resource implications below.

Adding Bio-Fuels to the Mix

Another major, if fairly recent, factor in the agricultural and food market is ethanol, which is alcohol distilled from grain starch and then mixed with gasoline. In an attempt to reduce its dependence on imported oil, the United States mandated that 10 percent of gasoline be blended with ethanol (15 percent by 2016) and provided a tax credit to assist gasoline blenders to comply. It also imposes an extremely high tariff on ethanol from other countries, such as Brazil. Canada has similar policies but with a 5 percent mandate and lower tariff protection.[7]

The policy is controversial, with arguments about the ethics of subsidizing food into energy, whether or not making ethanol uses more energy than it creates, its effects on supplies of ground water, and about the wisdom of creating an industry that relies for its survival on subsidies and border protection.[8] But those arguments aside, the ethanol policy has caused growth in demand for grain. In the crop year 2011, about 40 percent of the second-largest corn crop in US history will be used for ethanol.[9]

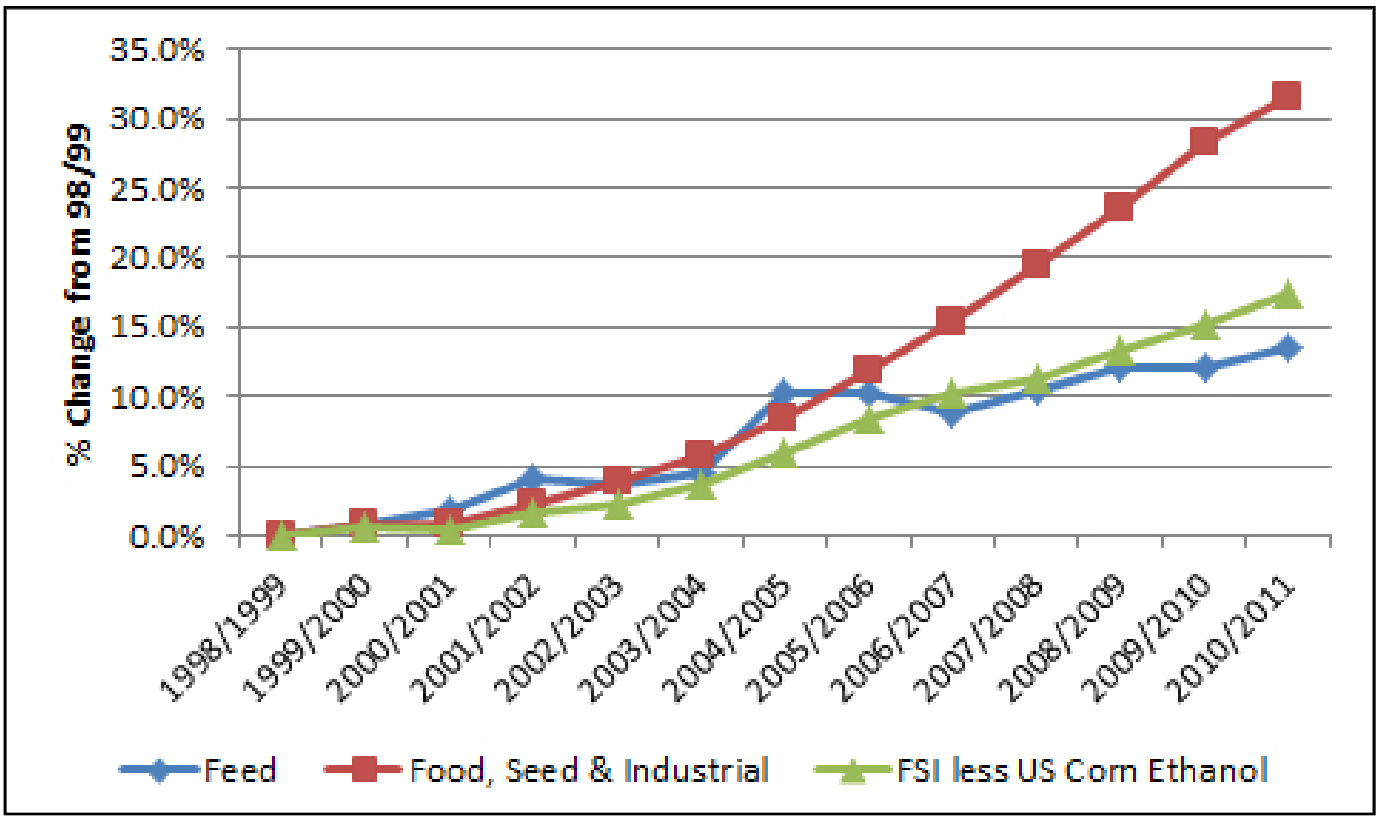
Figure 4 presents some perspective on the interaction of bio-energy and food demand. Food demand is growing rapidly; for grains, that includes direct consumption as food products and indirect use as feed to produce animal products.

Using 1998/99 as a base, Figure 4 shows the percentage change in demand for each of three uses of grain in each subsequent year. Overall, the one that is growing the least fast is direct use for livestock feed. It grew rapidly until 2004/5 and then flattened out. By the current year, annual direct feed use was about 14 percent greater than in 1998/99.

The second category is food, seed, and industrial. This includes direct food for consumers (corn flakes, wheat cereals, flour, corn oil, corn starch, high fructose corn sweetener, etc.) and a plethora of edible and non-edible products made from grains. It also includes ethanol. This source of demand grew very rapidly and is expected to be about 32.5 percent greater this year than in 1998/99.

The third line shows more clearly the change in demand for food. It is the food, seed, and industrial category, but with corn for ethanol removed. It increased to about 17.0 percent more in the current year than in 1998/99. Since the whole category rose by 32.5 percent, while the food portion grew by only 17 percent, the ethanol portion grew at an extraordinary rate.[10] In fact, it will be up by 86.5 percent this year over 1998/99.[11]

Figure 4 Percentage changes in world feed, seed, and industrial use of grains



Source: USDA - Foreign Agriculture Service, Production, Supply and Distribution Online

Bio-fuels now represent a large portion of the demand for grain. Even as demand for food may grow rapidly in the near future because of income and population growth, the policy-created market demand for energy has been growing much faster. Further, an ever-growing demand for energy will accompany economic growth in lower-income countries, and energy prices are likely to rise. While current policies remain in place for bio-fuels, energy demand for grains will likely also grow rapidly in the future. Perhaps even more importantly, the demand for energy will grow rapidly. Even if grain ethanol and the policies that created it are aborted, we are entering a period during which new sources of energy must be found – and the search will include renewable sources. Much of the exploration of new sources centers around products that are traditionally viewed as food, or that compete with food for land and other resources. This means that food prices will continue to be affected by energy prices for the foreseeable future, even without current bio-fuel programs.

If demand for food is projected to double by 2050, energy demands will require even more growth in agricultural production. This will be a daunting task.

Grain Stocks, the Barometer of the Food Industry

Monitoring the stocks to use (stocks/use) ratios for grains as a quick and simple method to track the pressures in the food industry will be helpful before turning to the resource implications of this growing demand.

As the demand for food increases, it draws on the resources needed to produce food. The grain industry is pivotal: people eat grain, meat, and milk, animals eat grain, and all other crops compete for land with grain. When grain prices rise systemically, all other prices eventually rise with them, either because they will have to rise to compete with grain for land (e.g., horticultural products) or because grain is a significant part of production costs (e.g., animal products). As we will see below, there is an inverse relationship between the stocks/use ratio and prices, as well as a relationship

with price volatility. Monitoring the stocks/use ratio will help us understand and anticipate what is happening and will happen with commodity and food prices.

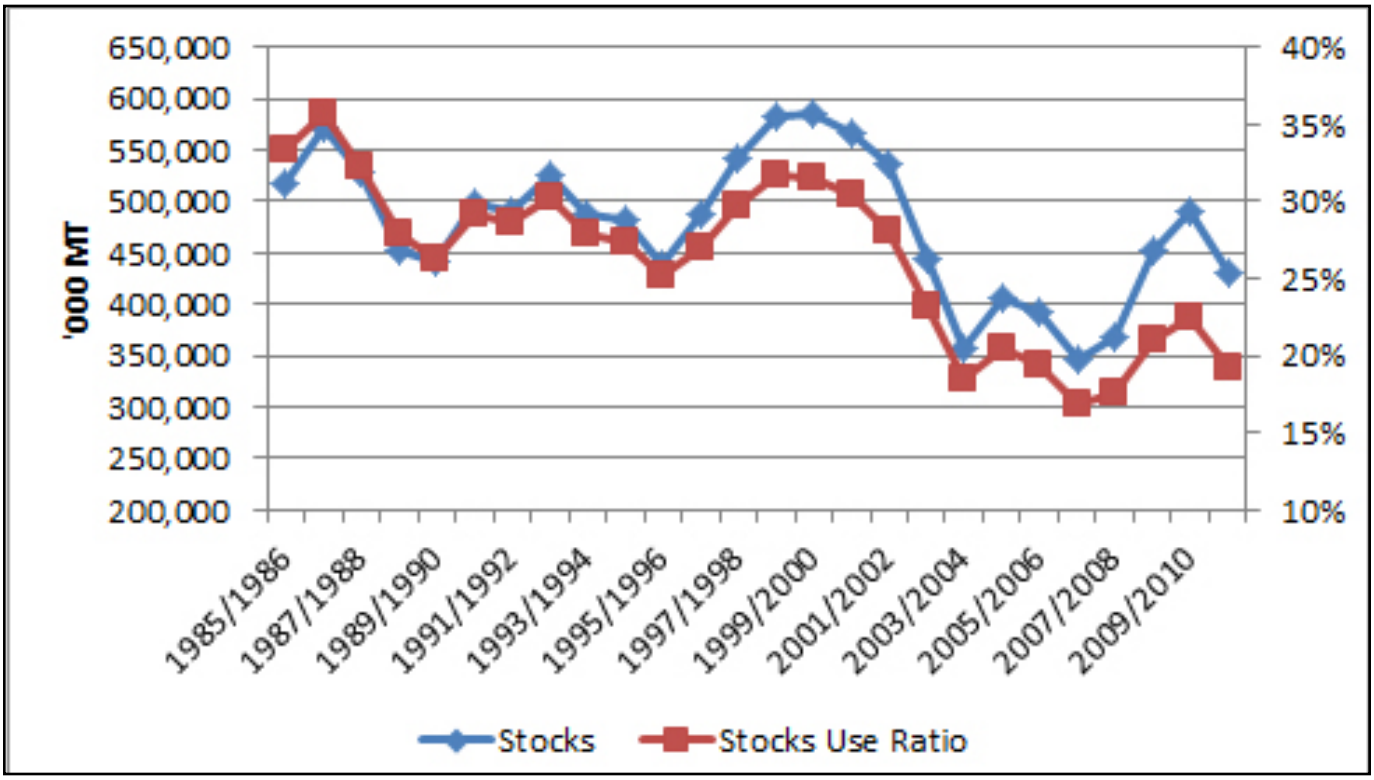
The stocks/use ratio is simply the ratio of the amount of grain in inventory at a given date (usually the end of a crop year) expressed as a percentage of the amount used in the year ending that date. It indicates how much is in inventory. If the ratio is 20 percent, then the world has 73 days – about 2.5 months – of inventory (20 percent of 365 days). If it is 10 percent, then we have about 36 days.

The key issues are how the trend toward higher demand affects the stocks/use ratio and then the consequences in terms of prices and price volatility. When demand is rising faster than production, stocks are drawn down, and the stocks/use ratio declines. That creates two effects on prices.

Figure 5 contains world grain stocks and the stocks/use ratios from 1985/86 to the most recent projection for the current year. What is obvious from the graph is that the general trend in stocks is downward. Second, the trend in the stocks/use ratio is trending downward even faster. This is logical because, as more people with more income eat more food and as more grain is used for fuel, use is rising: the same level of stocks this year gives a lower ratio than two years ago because use is higher now.

The data tell us that demand is increasing faster than production. Stocks are therefore being drawn down, and the stocks/use ratio is falling relatively fast because of the combination of factors.

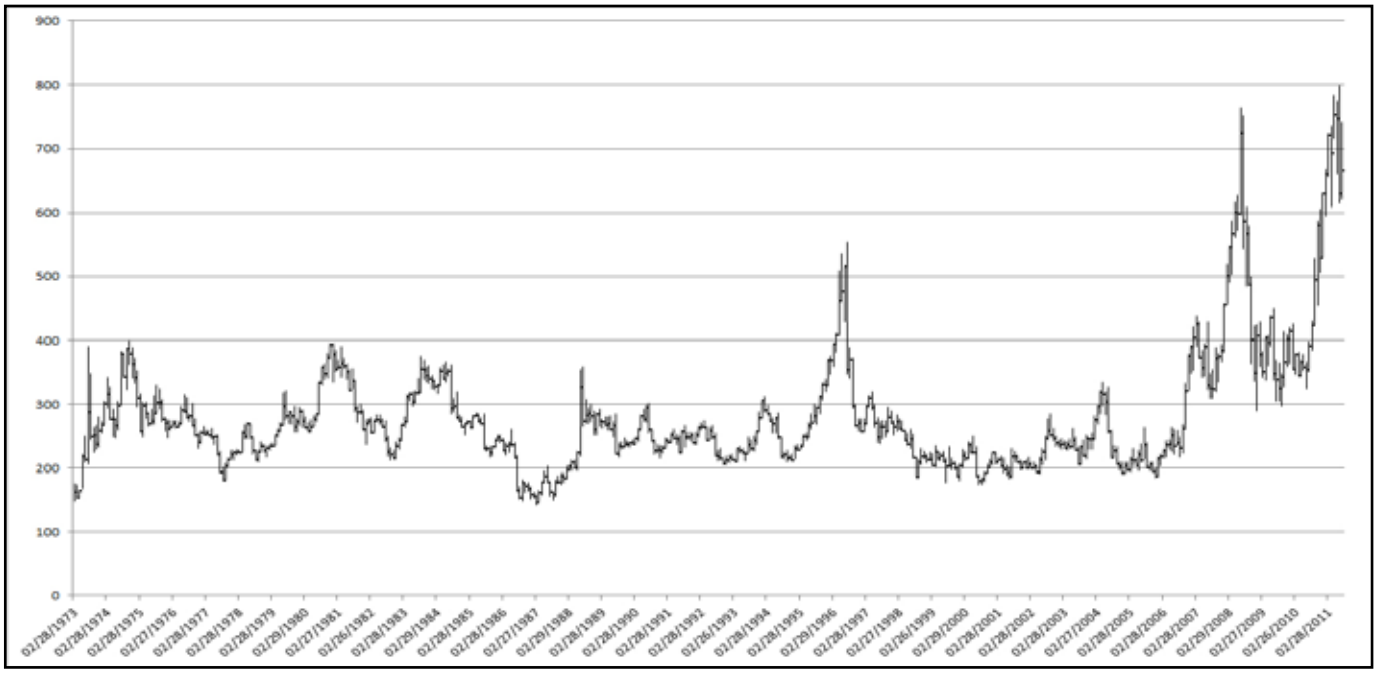
Figure 5 World grain production and stocks/use ratio 1985-2011



Source: USDA - Foreign Agriculture Service, Production, Supply and Distribution Online

The real implication of the stocks/use data becomes apparent when Figure 5 above is compared to Figure 6, which contains monthly prices for corn at Chicago since 1991. This is shown as the monthly high, low, and closing price on the nearby futures contract; it therefore shows both the level and volatility of prices. Prices for other commodities have roughly the same pattern, but with some differences related to specific conditions in each grain market.

Figure 6 Corn futures 1991-2011



Source: Reuters DataLink Subscription Service.

Comparing the two charts shows that they are essentially mirror images of each other in terms of price and inventory level, but there is also a secondary relationship with respect to volatility: when the stocks/use ratio is high, prices are low and relatively stable. But when the ratio is low, prices are high and volatile.

If food demand continues to grow as predicted above, we can therefore forecast the future, at least in general terms. Under these circumstances, grain and other prices will most likely continue to rise. Only significant breakthroughs in productivity or significant declines in prosperity or population could reverse the trend.

The fact that the within-month variation increases in the corn chart is a good indicator of price volatility. During the early 2000s when corn prices were low, they didn't change much within a calendar month. But since 2006, when the stocks/use ratio started to fall, the bars are much taller – indicating that prices changed as much or more than $2.00 per bushel in a month. In previous years the price level of $1.70 to $2.00 was less than the change in price we see within a month in recent years.

Although many factors affect price volatility, a major one is the effects of actual or perceived scarcity. Increasingly, the international food industry has adopted a "just in time" (JIT) approach to purchasing and managing inventories; that means that intermediate and end users do not like to hold inventories beyond those for work in progress and requirements for normal demands for transactions. Industries are accustomed to the security of reliable logistics for raw materials in most exporting countries. The tendency has been to keep inventories at the farm or the elevator in surplus regions or in the pipeline.

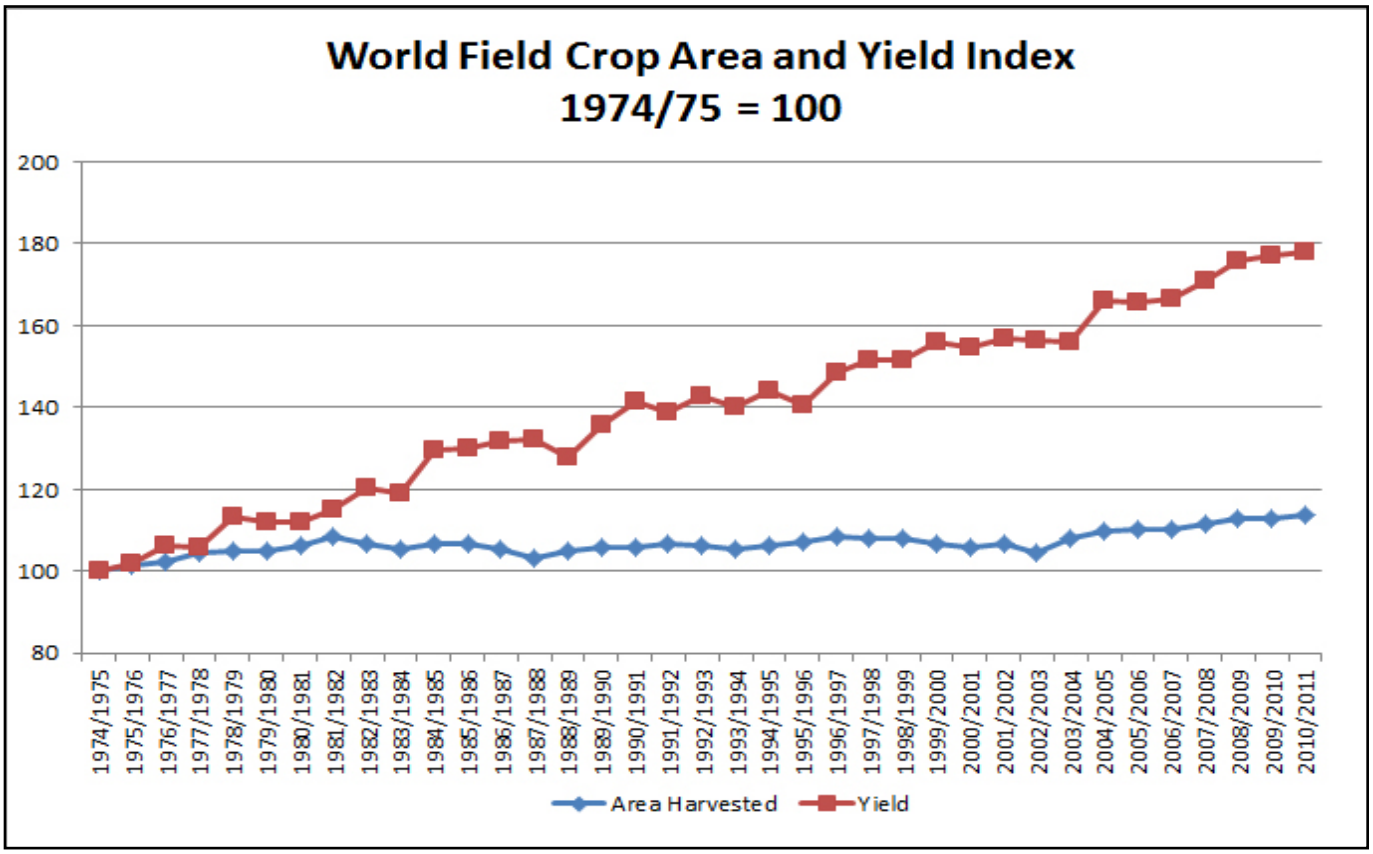
What happens when there is an actual or perceived shortage of grain? (We are experiencing some of this pressure in 2011 with the USDA forecasting less than 15 days of inventory of corn and soybeans.) The natural tendency is for end users to order a bit extra; they move from a JIT approach to a "just in case" (JIC) approach. This change has the effect of removing already scarce inventories from the elevator system and quickly bidding prices up. Conversely, if harvest prospects improve, end users now have surpluses they can use up; demand falls and prices plunge. The shorter the actual or perceived shortage, the more switch there is from JIT to JIC, and the greater the volatility.

The Challenge of Feeding Nine Billion More Prosperous People by 2050

While the possibility of food shortages and their implications for security are obvious, Canada has a huge opportunity because of our resource base. Canada has the third largest endowment of arable land per capita in the world[12] and an estimated 9 percent of its fresh water supply.[13] These advantages are important.

The world will clearly need land and water to be transformed into food more efficiently. Until recently, food production for both purposes has kept up with demand. Figure 7 shows how this was achieved: the amount of land farmed changed marginally, but yields rose by 75 percent since 1975. World population grew by considerably more than 10 percent, so the amount of farmland per capita has actually declined. Yield growth was the major contributor to increased food production.

Figure 7 Crop area and yield 1974-2010



Source: USDA - Foreign Agriculture Service, Production, Supply and Distribution Online

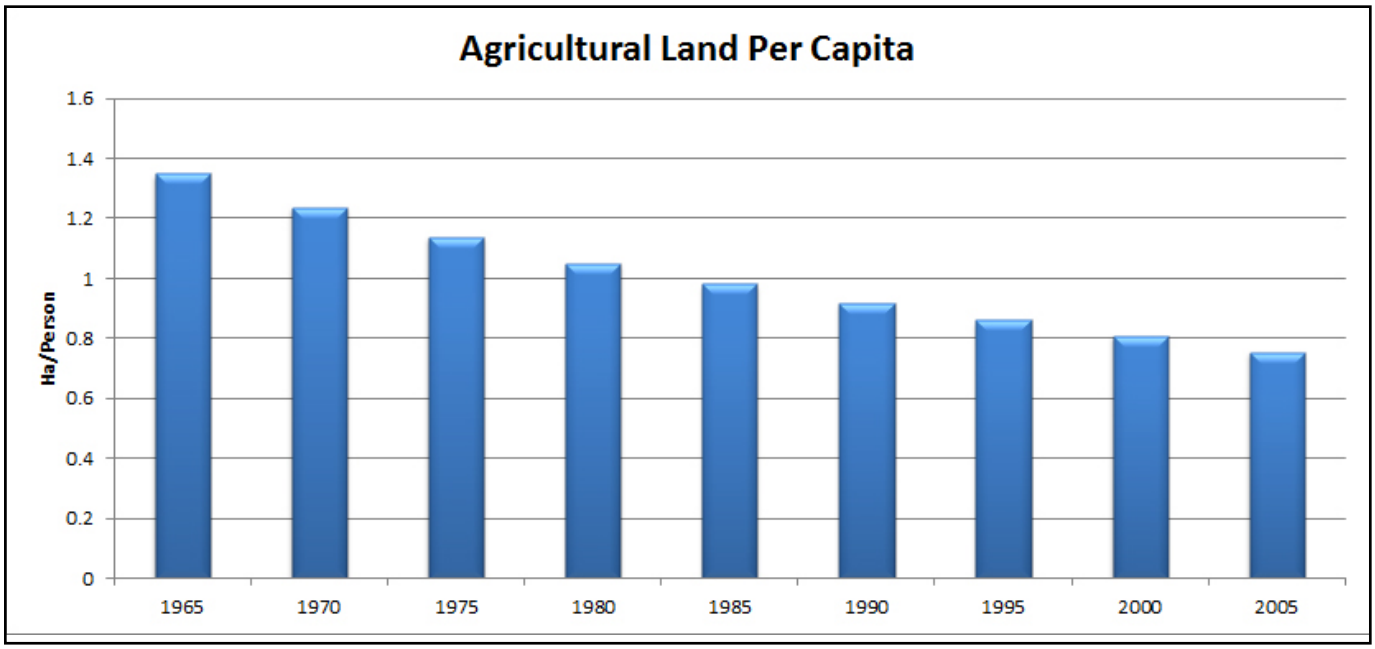
Constraints on the Expansion of Food Production

Can the production of food continue to keep up with demand? The first constraint is limits on natural resources – the availability and fertility of arable land, and of enough fresh water to grow crops. The second involves difficulties with productivity growth. Over time, that growth has been declining: yields of staple crops grew by about 3 percent a year during the 1960s, but have slowed to one percent per year since.[14] Some have estimated that total factor productivity – a single measure of all natural and capital inputs – needs to grow by 1.75 percent a year to produce enough food to meet projected demands by 2050; current growth is only 1.4 percent per year. [15]

i. Land and Soil

The adage about land – "they ain't making any more of it" – is not quite true; several million acres of agricultural land have been cleared in Brazil, for example, in the past two decades and more is available there and elsewhere. Even so, other land is going out of agricultural production in many areas of the world because of urbanization, environmental degradation, and declining water tables. The net result is that, on a per capita basis, agricultural land is declining rapidly, as shown in Figure 8.

Figure 8 Agricultural land per capita



Source: FAO

Another fact about land is its distribution. "The world's arable land is not distributed around the world in the same proportion as its population."[16] Table 5 contains the distribution of population and the distribution of arable land in a sampling of countries. It shows that the three areas with the most people do not have a commensurate amount of land.

Canada has the third largest endowment of arable land per capita, just behind Australia and Kazakhstan. Although Australia has the most arable land per capita, the quality of the land is relatively low, [17] largely because of water availability. Kazakhstan ranks second but lacks in infrastructure. Most of Canada's competitors have less than half the arable land per capita available in this country, while its potential customers have even less. That makes Canada's land base a real strength for the future.

Table 5 Arable land per capita, by country

Country	Population	Total Land Area (ha)	Arable Land (%)	Arable Land per Capital (ha)
Top 3				
Australia	21,766,711	768,230,000	6.15	2.17
Kazakhstan	15,522,373	269,970,000	8.28	1.44
Canada	**34,030,589**	**909,350,700**	**4.57**	**1.22**
Canada's Competitors				
United States	313,232,044	916,196,600	18.01	0.53
Chile	16,888,760	74,381,200	2.62	0.12
Germany	81,471,834	34,867,200	33.13	0.14
France	65,102,719	54,997,000	33.46	0.28

Canada's Potential Customers				
China	1,336,718,015	959,696,100	14.86	0.11
India	1,186,172,906	297,319,300	48.83	0.12
South Korea	48,754,657	9,692,000	16.58	0.03

Source: GMC analysis based on CIA World Factbook data.

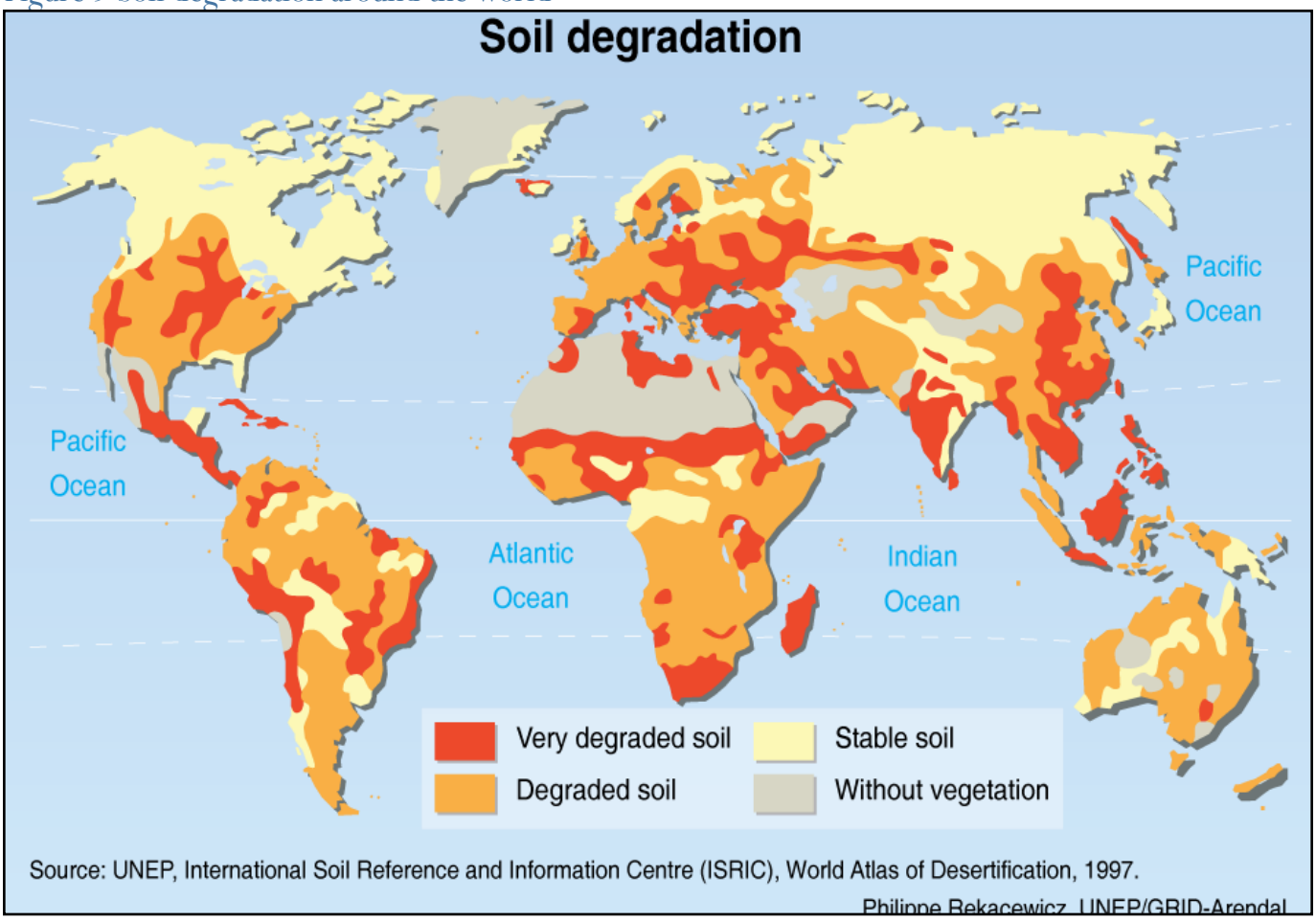
ii.Quality and Health of Soils

Along with land, healthy soils are not distributed evenly around the world. Perhaps more importantly, many of the world's soils have been badly degraded. This includes much of Asia and Africa, the areas where demand for food is increasing rapidly.

These soils have lost quality, productivity, and utility due to erosion, desertification, and/or significant use of chemicals instead of organic matter to try to improve their productivity.[18] Figure 9 shows that Canada has suffered less from this than most other countries. Canada has some of the most stable soils in the world – another significant advantage in its ability to take advantage of global market trends. Table 6 shows how dependent agriculture is on chemicals in some parts of the world, whereas Canada's use of nitrogen fertilizers and pesticides are lower than some of its competitors and potential customers – hence ensuring that the soils remain healthy for future agricultural production.

The trend toward soil degradation means that it will be difficult to maintain soil fertility with current practices. The converse is that future technology will need to include processes to enhance soil fertility as well as to coax ever-increasing yields from our soils. Again, Canada's favourable position further underlines the potential role that Canada can play in an increasingly hungry world.

Figure 9 Soil degradation around the world



Source: UNEP, International Soil Reference and Information Centre, World Atlas of Desertification, 1997

Table 6 OECD environmental indicators

Country	Nitrogen Fertilizer Use: t/km2 of ag land	Pesticide Use: Active Ingredient t/km2 of ag land
Canada	**2.91**	**0.06**
Australia	0.21	0.01
France	7.85	0.24
Germany	10.48	0.19
US	2.63	0.07
Japan	10.68	1.16
Korea	18.82	1.27

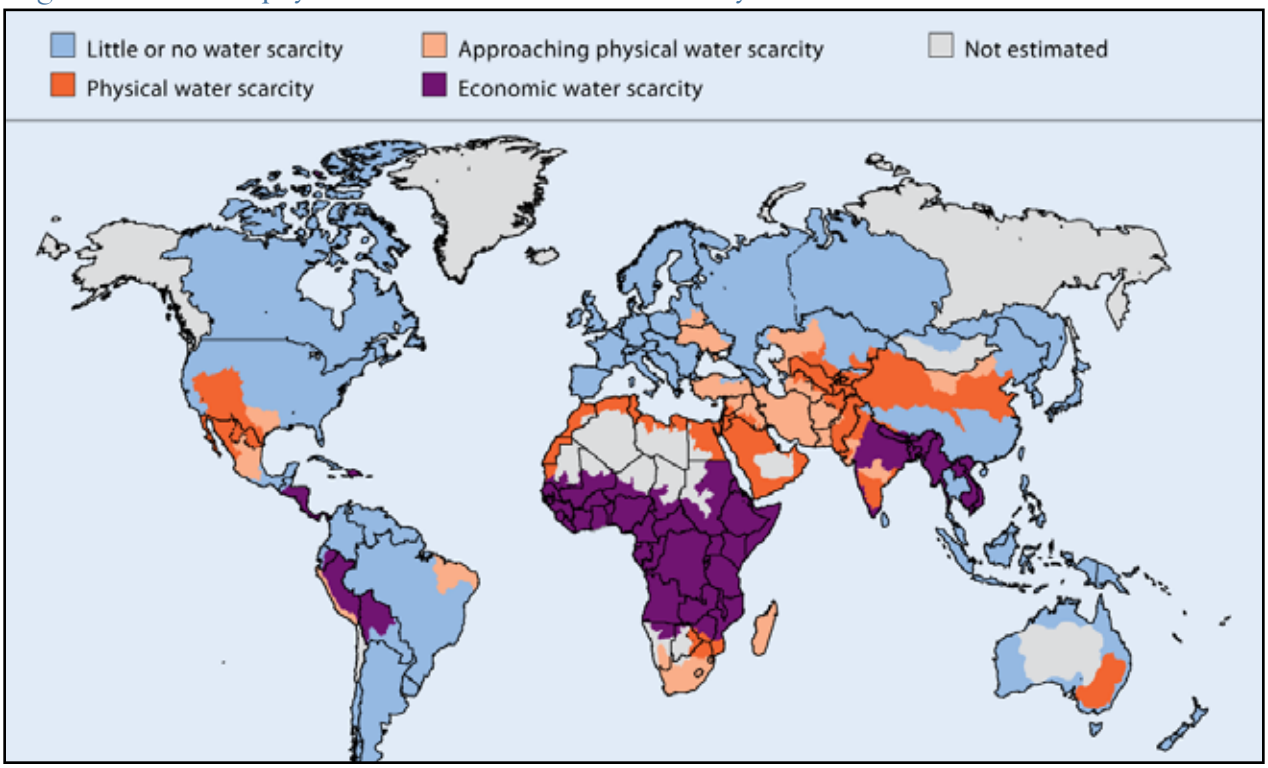
Source: OECD Environmental Data Compendium 2008: Agriculture

iii. Water

As economies grow, so does the demand for water: more people consume more fresh water and higher-income people consume more in their daily activities. As stated, they also consume more animal products, as well as fresh fruits and vegetables, all of which require more water than traditional subsistence crops. Hence the need for water increases almost exponentially.

Figure 10 shows that much of the world faces some degree of fresh water scarcity. Water tables are declining in India, northeastern China and the area around the Dead Sea.[19] Desertification is spreading and major areas face "economic water scarcity". That term means that these areas actually have enough water to meet demands, but lack the funds to build infrastructure like dams and canals that might make it accessible.[20]

Figure 10 Areas of physical and economic water scarcity



Source: International Water Management Institute, 2009

Even larger areas face physical and absolute shortages, meaning aquifers have been depleted.[21] The areas of the world, moreover, with both economic and physical scarcities of water are the same regions with significantly increasing demand for food.

Figure 10 also shows that Canada is one of the few countries that has no water shortage. Table 7 shows that Canada's use of its renewable water resources as a percentage of total resources is very low compared to its competitors, as well as to potential customers. Canada has little or no physical or economic water scarcity and is considered a freshwater-rich nation. While Canada houses only 0.5 percent of the world's population, our landmass contains approximately 9 percent of the world's renewable freshwater supply (water replenished by precipitation on a short-term basis).[22]

Canada's advantage in having both land and water available for production is that it is much easier and more economical for countries to import food products than water. In a sense this represents a "virtual water trade", where the water that was consumed to produce agricultural commodities is contained in the products rather than in raw form.

Table 7 Actual renewable water resources per capita

Country	M^3/capita	% Withdrawn by Agriculture
Water Rich Countries		
Greenland	10,578,947	
Congo	196,319	
Canada	88,336	0.19
Canada's Competitors		
United States	6,815	6.4
Australia	23,911	3.7
Chile	55,425	0.86
Germany	3,343	
France	1,862	
Canada's Potential Customers		
China	2,125	15.0
India	1,670	
South Korea	1,448	

Source: EarthTrends World Resources Institute, from FAO Land and Water Development Division, 2007 and FAO AQUASTAT

These facts set the context for the challenge of feeding a world whose population is increasingly able to buy food. In order to produce it, countries like Canada need to innovate and invest in ways that enhance productivity. Such innovations must address sustainable production practices that retain and indeed restore soil, and address water conservation. In short, the agricultural sector must think beyond "yield per hectare" and bring water and soil quality into the yield measurement.

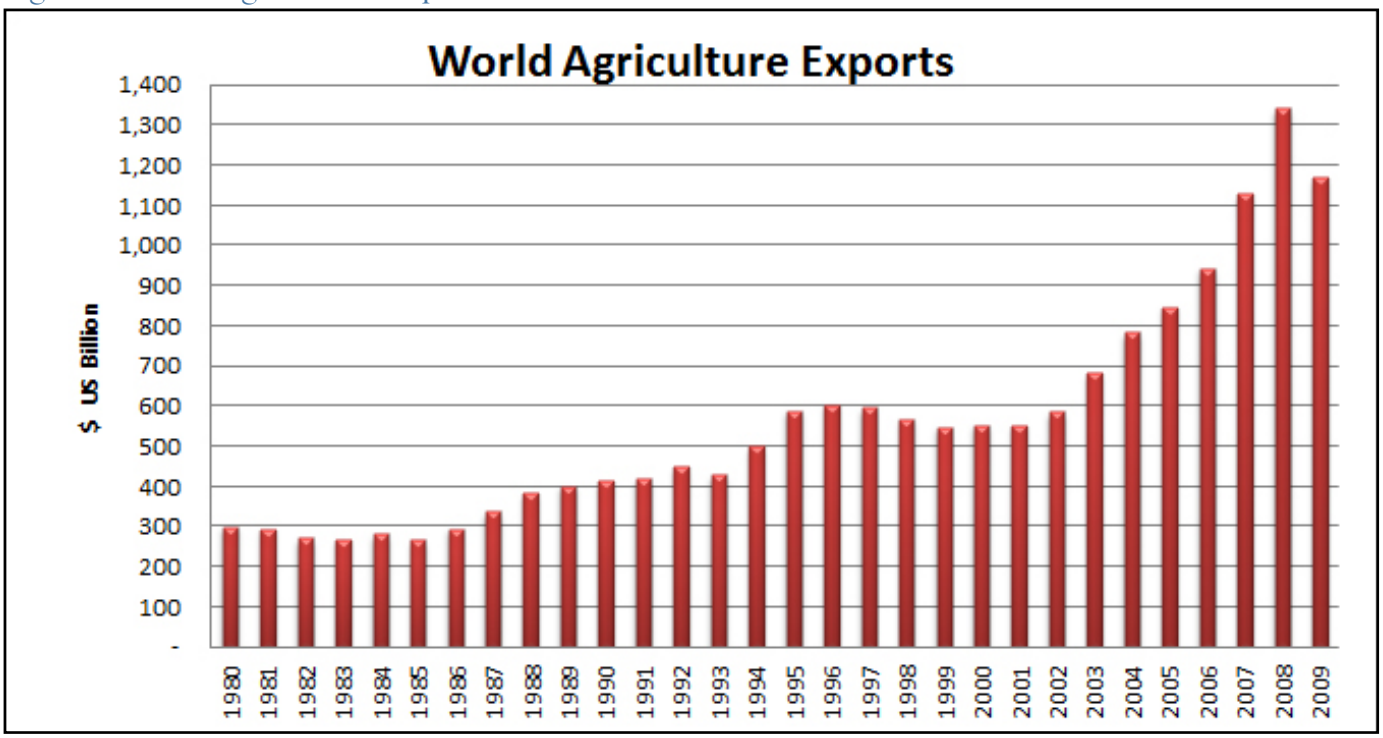
Resources are not spread equally among people and nations. Those parts of the world that have the fastest-growing populations, and in many cases the fastest-growing economies, also have less land, sometimes lower quality land, and less water than do countries like Canada.

A Canadian Trade Advantage?

The clear implication of the data presented is that international trade can become increasingly important in feeding a hungry planet. Yet that trade in food is highly restricted by domestic policies. Ironically, in many cases those policies are imposed by the same countries that will need more food imports in the future.

Despite these blocks, the value of international trade in agriculture and food products has risen geometrically over the past few years, with the exception of 2009 when the international recession curbed it (Figure 11). Note that the value of this trade hovered around $600 billion during the late 1990s and early 2000s. By 2008, it had more than doubled to nearly $1.4 billion. Even in 2009, with a worldwide recession and lower commodity prices, the value of international trade in foodstuffs remained near $1.2 billion.

Figure 11 World agricultural exports



Source: WTO

In the short term, trade restrictions are a legal issue. In the longer term, it will become an ethical and moral issue for both importing and exporting countries. As demand for food increases and resources are stretched, and it becomes increasingly obvious that resources are not distributed equally, we will see considerable pressure to reduce barriers to trade. If food shortages occur, that pressure will intensify.

The emerging and expanding market for food gives Canada a considerable competitive advantage. As we pointed out, this country has the third largest endowment of arable land per capita in the world. Relative to most other countries, that land has minimal degradation. We also have one of the largest endowments of freshwater and draw a tiny fraction of what is available.

Canada also has a well-developed infrastructure with which to transport and ship agricultural and food products across the country, into the United States, and into other export markets. The World Economic Forum Global Competitiveness Index ranked Canada 9th of 139 (with a score of 5.8 out of 7) on its infrastructure, including the quality of roads, railroads, ports, air transport, and electricity supply.[23] Compare this to Brazil, a developing agricultural power and direct competitor, which was ranked 93rd (with a score of 3.6) due to poor quality ratings on its roads and ports.

Canada also has an extensive and world-renowned community of scientific research institutions that have excelled in primary research for the agricultural sector. The World Economic Forum's Global Competitiveness Index ranked Canada 8th of 139 for the quality of those scientific institutions. Much of that research takes place collaboratively between

universities and industry. Both federal and provincial governments operate agricultural research stations and maintain staffs of scientists dedicated to agricultural research.

With all these assets, Canada should be a world leader in agriculture and food. Unfortunately, the facts show that these opportunities are, for the most part, squandered.

The Performance of Canada's Agriculture and Food Sector

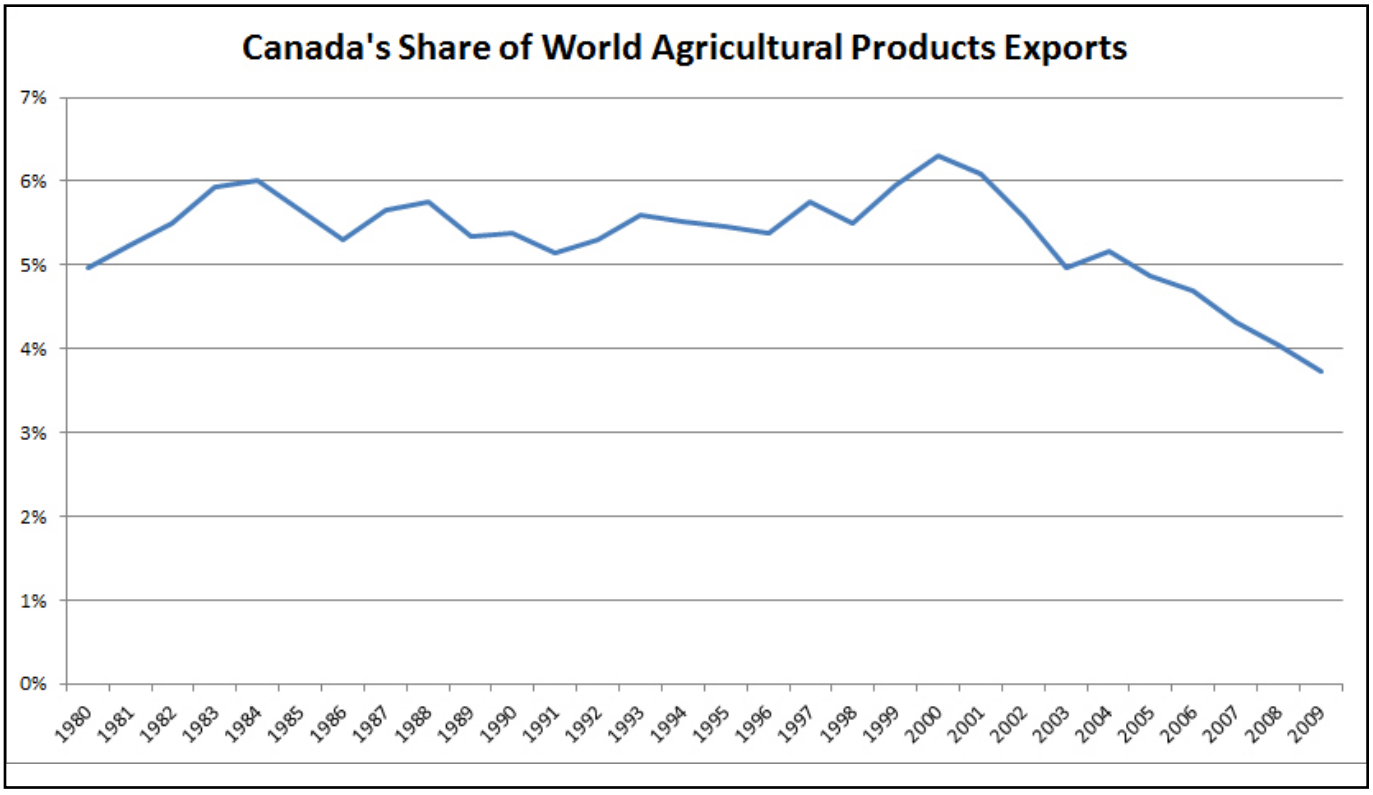
One may measure market performance in many ways. One is "market share", the percentage of world trade in commodities for Canada's primary products, as well as manufactured food products. When market shares decline, the reason is usually policy, or productivity, or both. Therefore, a second aspect of measuring Canada's market performance will entail an examination of productivity both in primary agriculture and in our food-processing industries.

Export Shares

As we already stated, international trade in agricultural and food products has been rising rapidly and will likely continue to do so. We also saw that Canada has a superior resource base and infrastructure that should give us a competitive advantage in this industry. But that is not what has happened.

Figure 12 shows Canada's share of world exports of agricultural and food products from 1980-2009. The data indicates that Canada has not been a major player, and that our market share is declining. Until the early part of the last decade, Canada's share ranged between five and six percent. In the current decade when world trade really took off, Canada stayed behind. In the most recent year, our share fell below four percent.

Figure 12 Canadian share of world agriculture exports



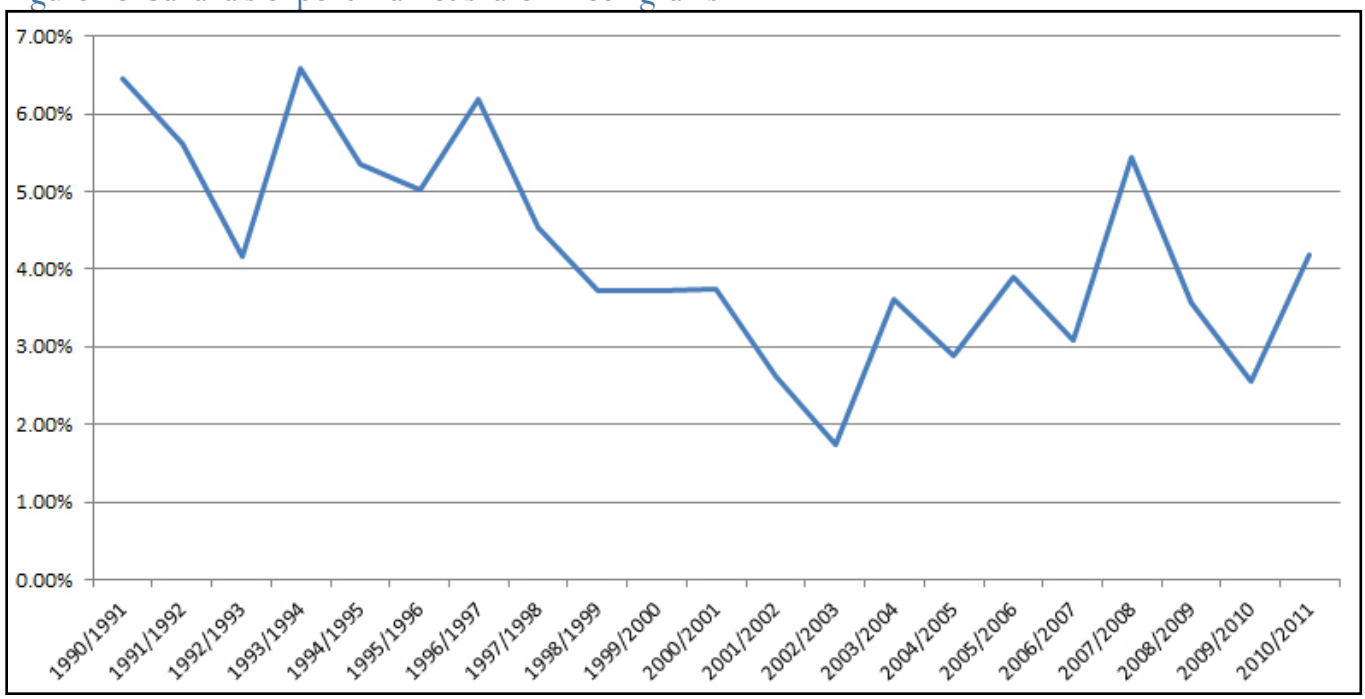
Source: WTO

i. Wheat and Barley

Canada is traditionally viewed as a wheat and barley-producing country.

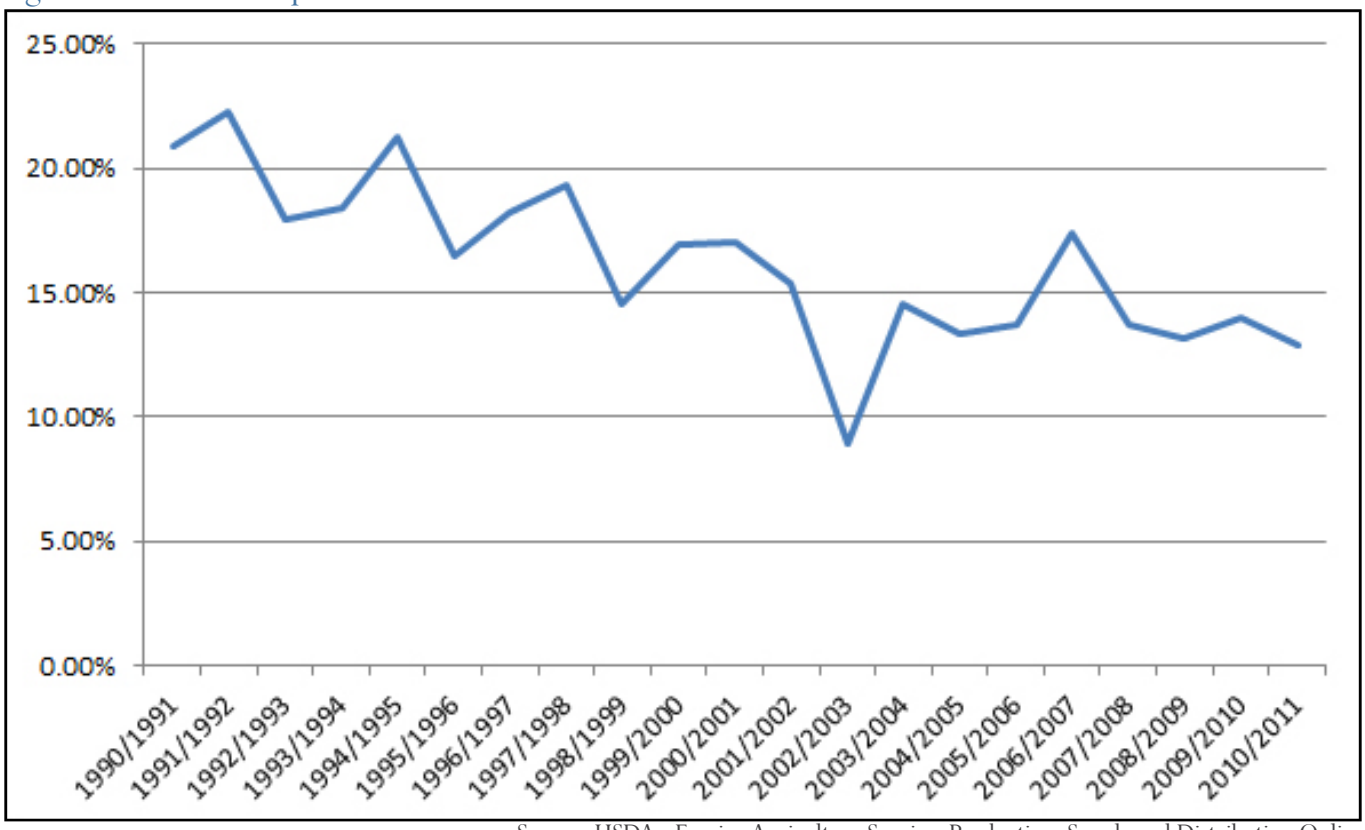
Figures 13 and 14 illustrate Canada's share of international trade in feed grains (including barley, corn, sorghum, and other minor grains) and in wheat since 1990/91. It is quite obvious that Canada's market share deteriorated in the past ten years.

Figure 13 Canada's export market share in feed grains



Source: USDA - Foreign Agriculture Service, Production, Supply and Distribution Online

Figure 14 Canada's export market share in wheat



Source: USDA - Foreign Agriculture Service, Production, Supply and Distribution Online

Feed grains include corn; given the great growth in corn production in the United States and South America, this decline in Canadian market share may not be surprising. However, it should be noted that Canadian acreage of barley declined from over 4.0 million hectares in the early 1990s to under 3.0 million hectares in 2010.

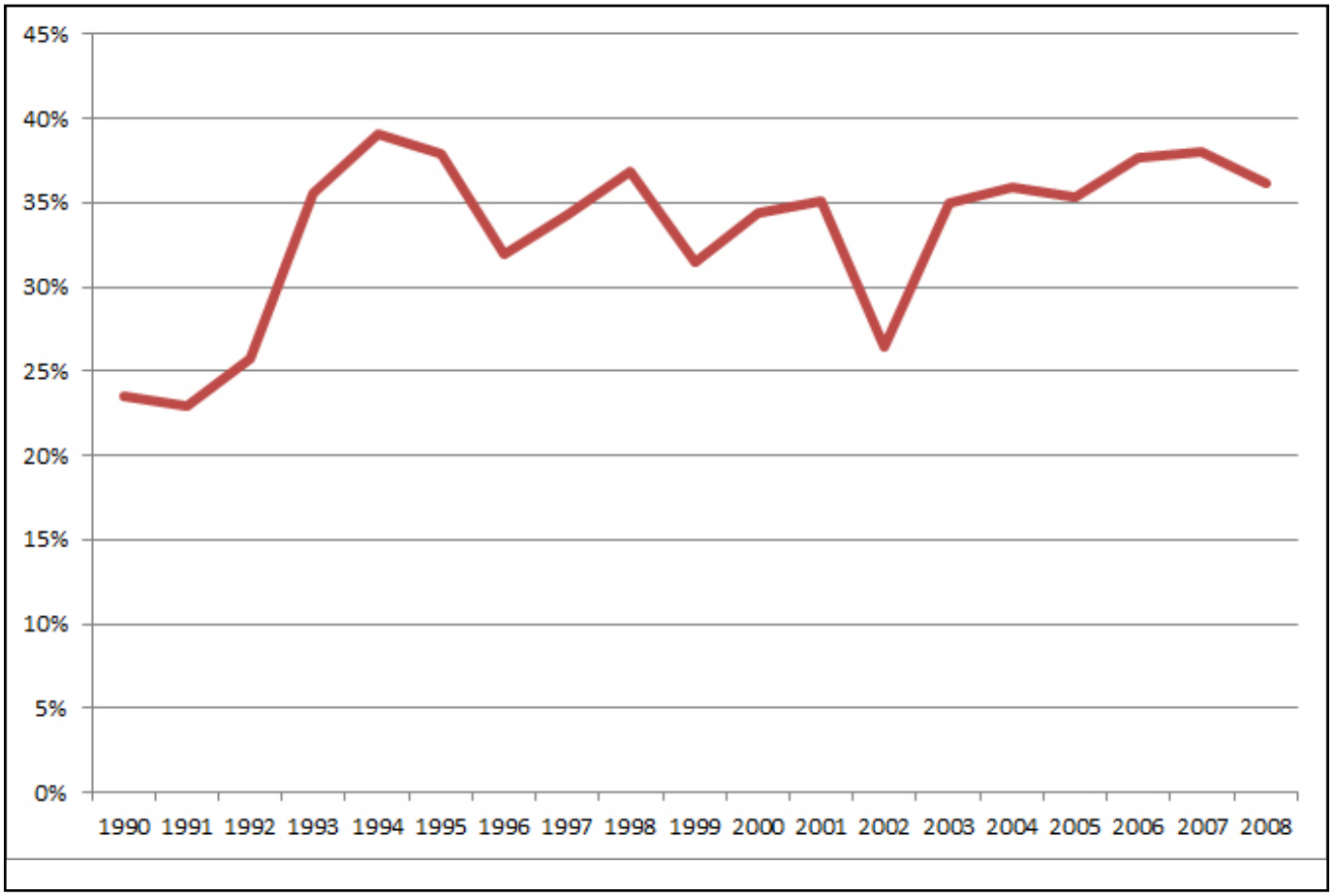
What should also be surprising is the diminution of Canada's importance in the wheat market. Figure 14 demonstrates that Canada's share of exports fell from over 20 percent to under 15 percent in the years since 1990. Part of the reason for this decline is a decline in Canadian wheat acreage from over 14.0 million hectares to less than 9.0 million.

The explanation is complex, although, as with barley, the bottom line is that other crops give a higher return to farmers than wheat. Canadian farmers respond to economic incentives, and these two traditional crops have not provided them.

ii. Canola and Pulses

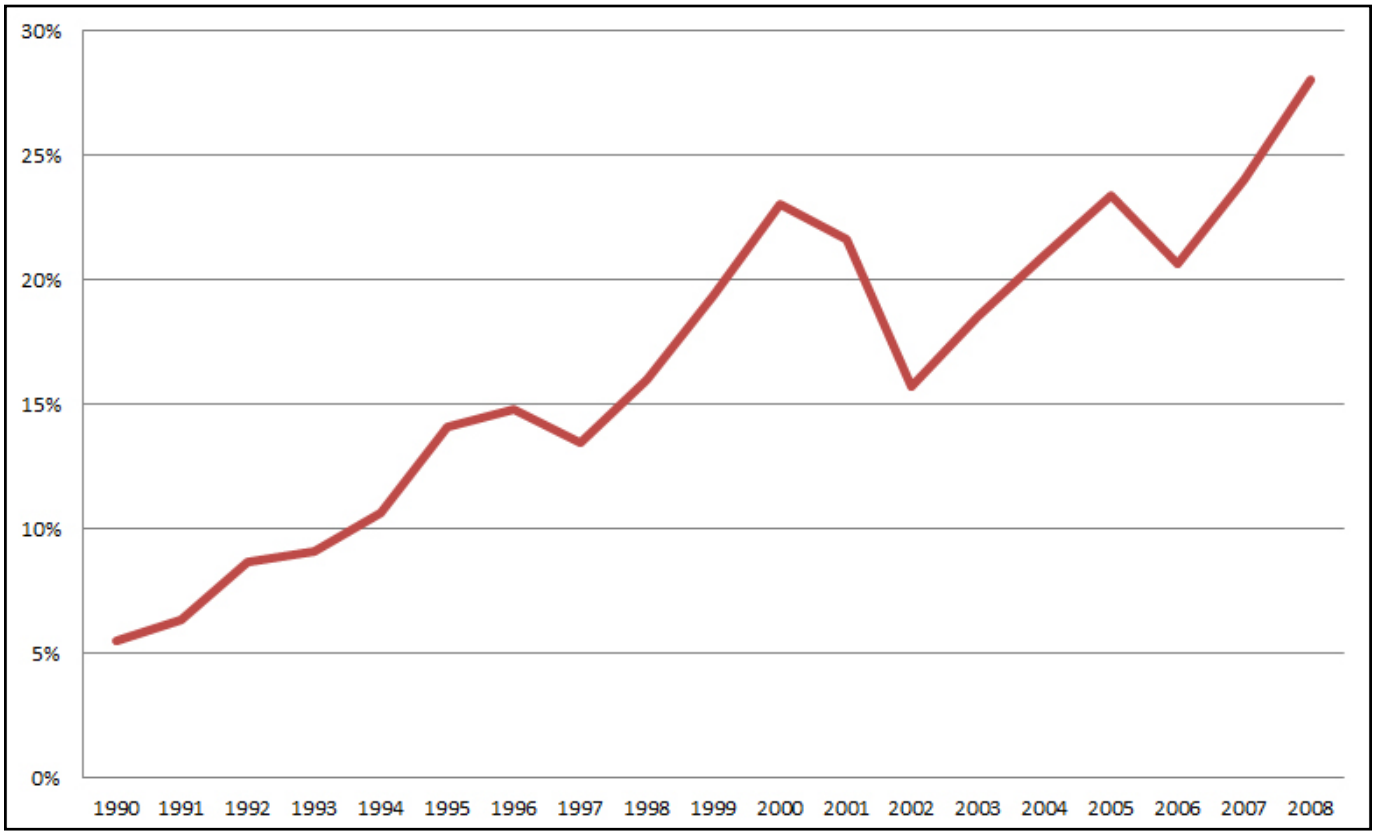
Canola and pulses have replaced much of Canada's wheat and barley production.[24] Figures 15 and 16 contain Canada's shares of trade in canola (rapeseed)[25] and its oil as well as Canada's share of trade in pulses.

Figure 15 Canada's export market share in rapeseed



Source: FAOSTAT, 2011

Figure 16 Canada's export market share in pulses



Source: FAOSTAT, 2011

Figure 15 shows that Canada gained in market share of the canola market until the early 2000s, and became the world's largest exporter at 35 to 40 percent of world trade. Since then, Canada's share has remained flat.

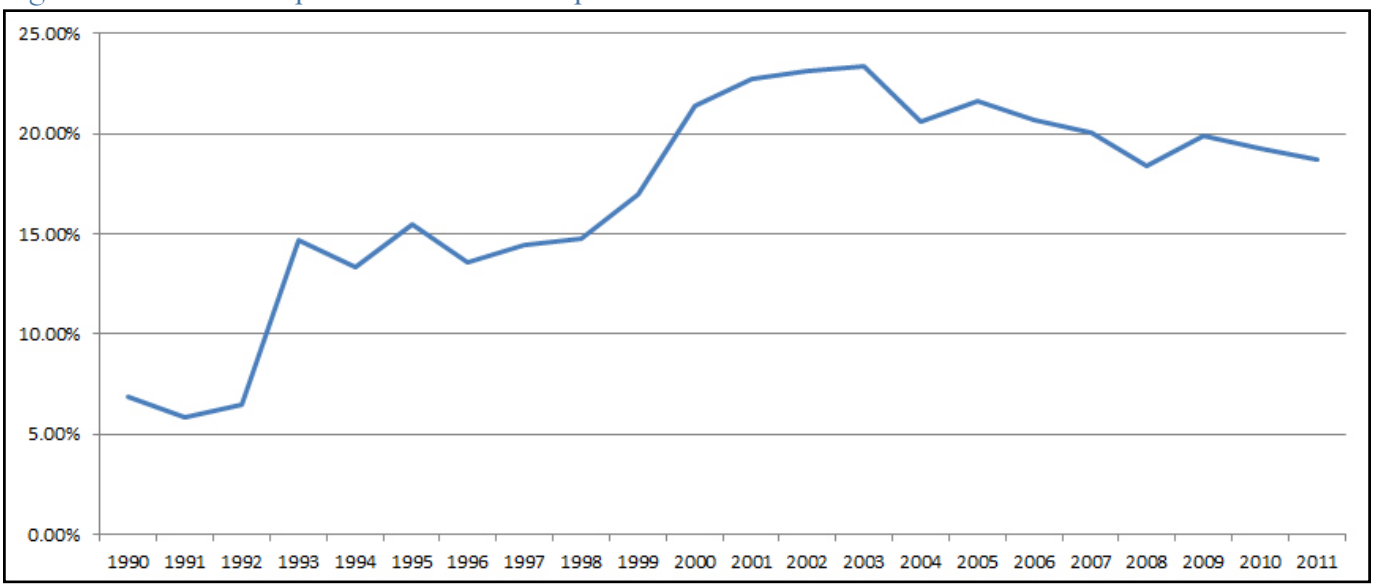
The one area in which Canada has gained market share is pulses. As Figure 16 shows, Canada moved from about 5 percent of world trade in the early 1980s to over 25 percent by the end of the 2000s. The growth in pulse acreage, as well as canola, occurred because these products usually offer farmers higher net returns than alternatives.

iii. Livestock Products

Earlier, we pointed out a dramatic increase in world meat consumption. Indeed, after the removal of Canada's subsidies on transportation of grains from the Prairies to Eastern Canada and the Pacific in 1995, Western Canada geared up to be a major producer and exporter of meat products.[26]

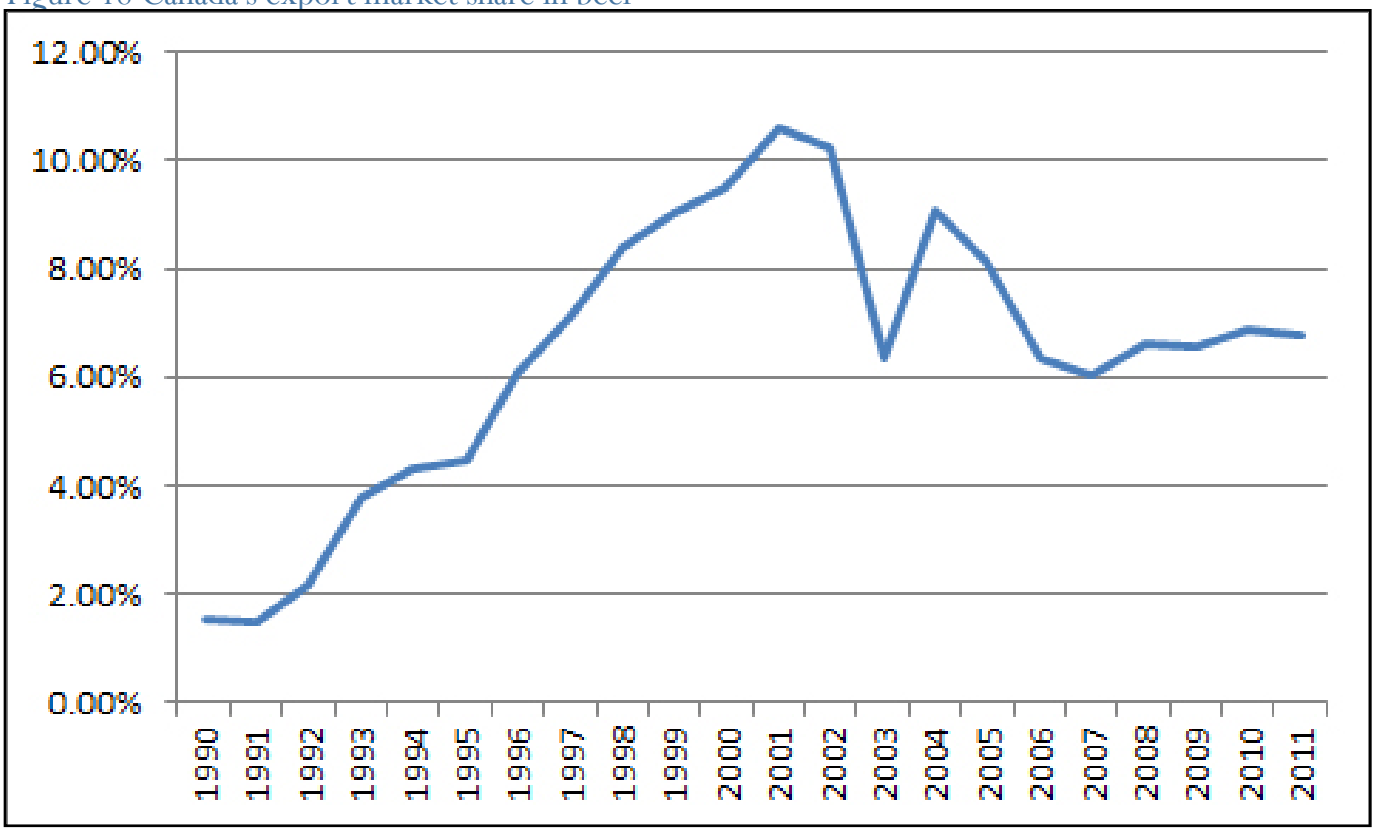
Canada's export market shares for pork and beef are contained in Figures 17 and 18, and they show that we did begin to gear up during the 1990s. In pork, Canada challenged the United States and Denmark to be the leading exporter, with a market share that reached almost 25 percent. Canada's share of international trade in beef quintupled during the 1990s to over 10 percent.

Figure 17 Canada's export market share in pork



Source: FAOSTAT, 2010

Figure 18 Canada's export market share in beef



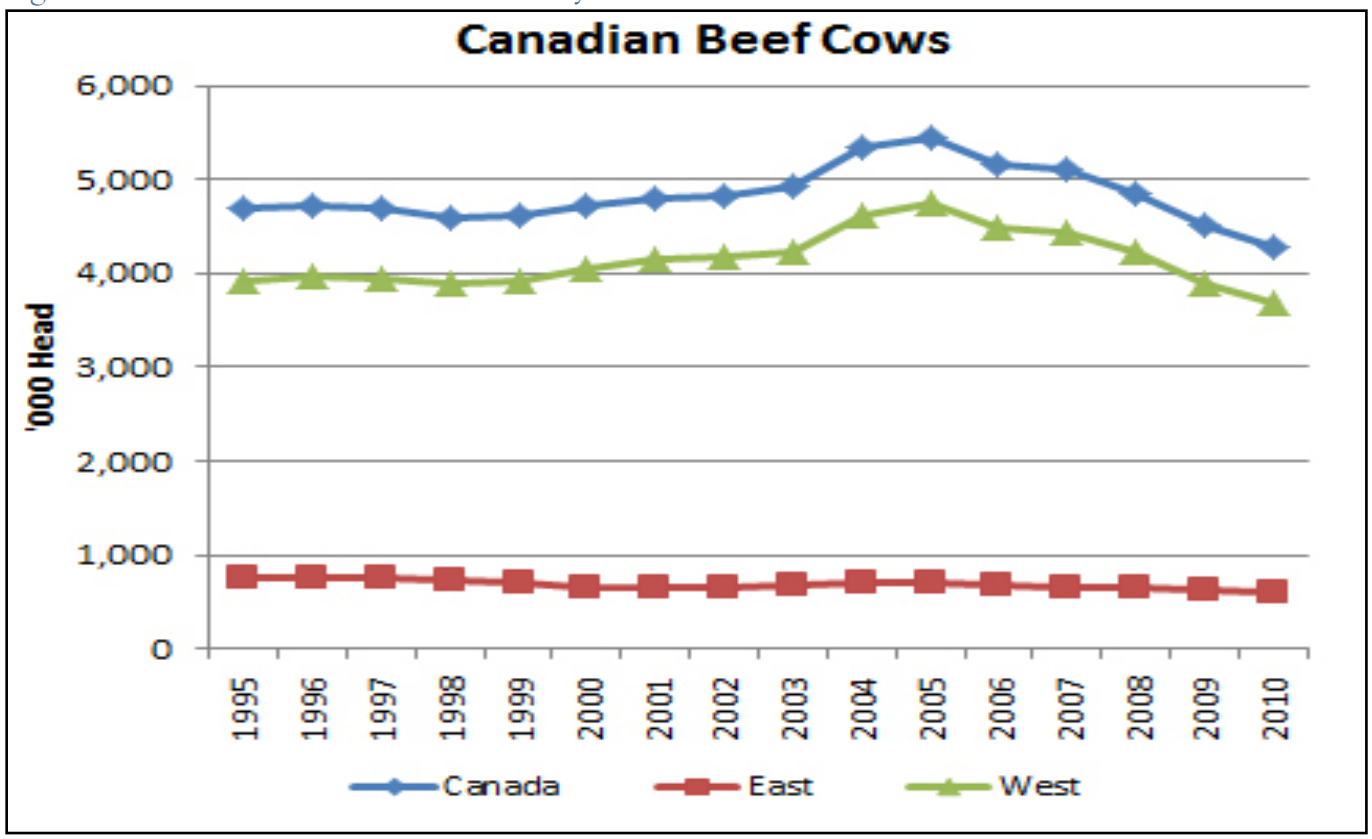
Source: FAOSTAT, 2010

The Shrinking Red Meat Industries

But after 2004, Canada continuously lost market share. In the face of history's largest increase in world demand for meat, Canada's livestock industry is downsizing. Why has Canadian production flagged in the face of surging world demand?

Between the mid-1980s and 2005, the Canadian inventory of beef cows increased by 68 percent. The sow herd also increased by over a third from the late 1990s to the mid-2000s. Figures 19 and 20 show only breeding stock, and do not account for rather substantial increases in productivity. Beef cows now wean a higher proportion of their calves and at higher weights. Sows now have more pigs per litter and slightly more litters per year. Carcass weights of finished cattle and hogs are higher than they were a decade ago. Therefore, the amount of pork and beef produced per female in the breeding herd is now much higher.

Figure 19 The Canadian beef cattle industry



Source: Statistics Canada Livestock Survey

Figures 19 and 20 also show that the livestock boom of the 1990s turned into a fizzle during the 2000s. The beef herd is down by about 10 percent. The sow herd declined by 20 percent from its peak and the pork industry has all but disappeared in British Columbia and the Maritime provinces.

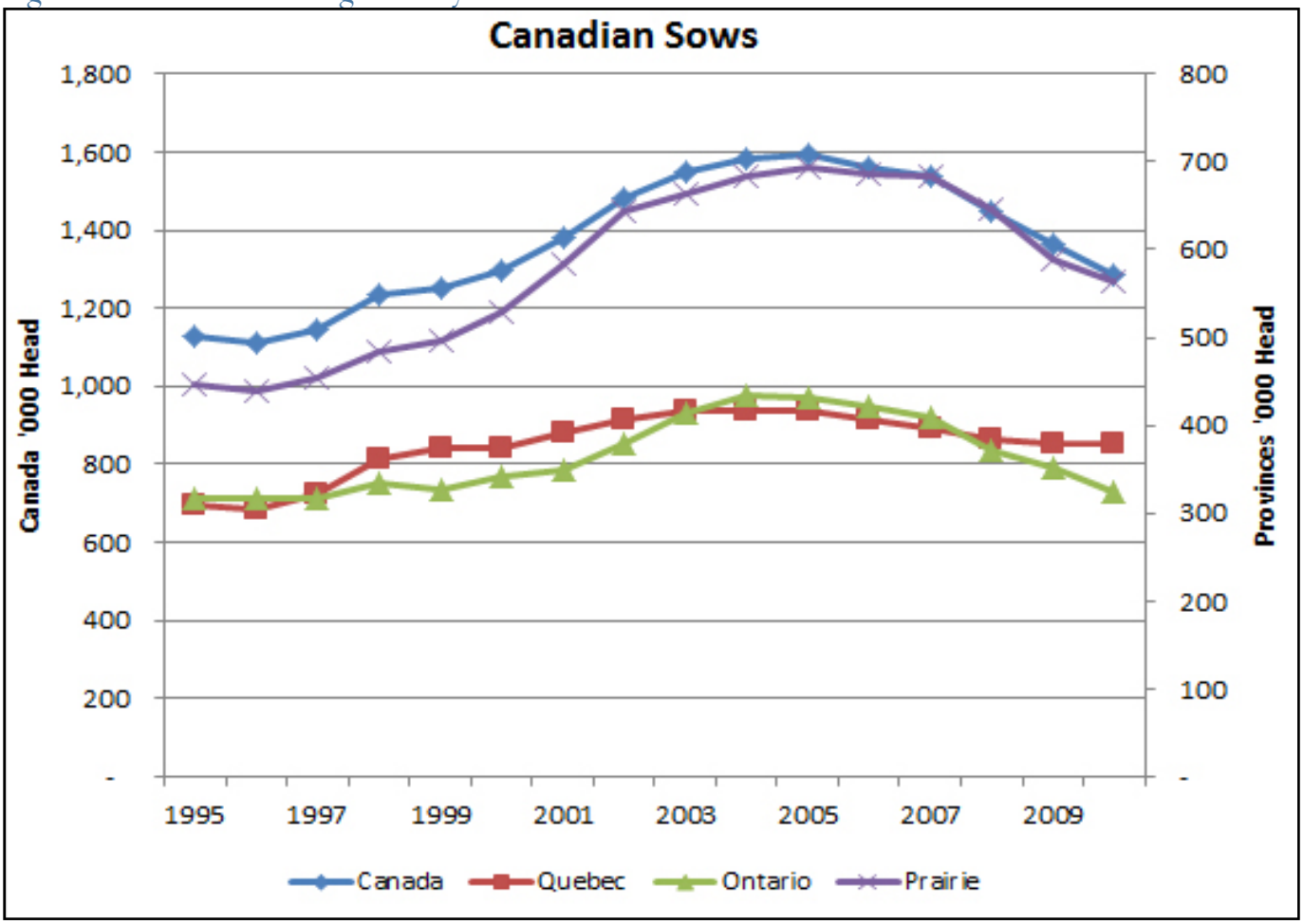
During the late 1990s, Canada produced pork at a comparatively low cost.[27] In the next decade, however, a number of factors negatively affected this advantage:

- Grain prices in general rose rapidly after 2005, which increased hog production costs; this affected the industry worldwide.
- In Canada, grain prices rose more rapidly in 2008/09 than elsewhere because of a shortage of wheat. This negatively affected grain prices more in Western Canada than elsewhere.
- The Canadian dollar rose against the United States and other currencies rather continuously, and thereby squeezed margins in Canada.

- "Swine flu", a misnamed strain of influenza, curtailed demand for pork in 2008/2009.
- The United States imposed Country of Origin Labeling regulations on Canadian pork that negatively affected the Canadian industry.

All of these factors have been well and widely documented. What has not is perhaps an even more fundamental issue: Canada has not had market access to the developing world.

Figure 20 The Canadian hog industry



Source: Statistics Canada Livestock Survey

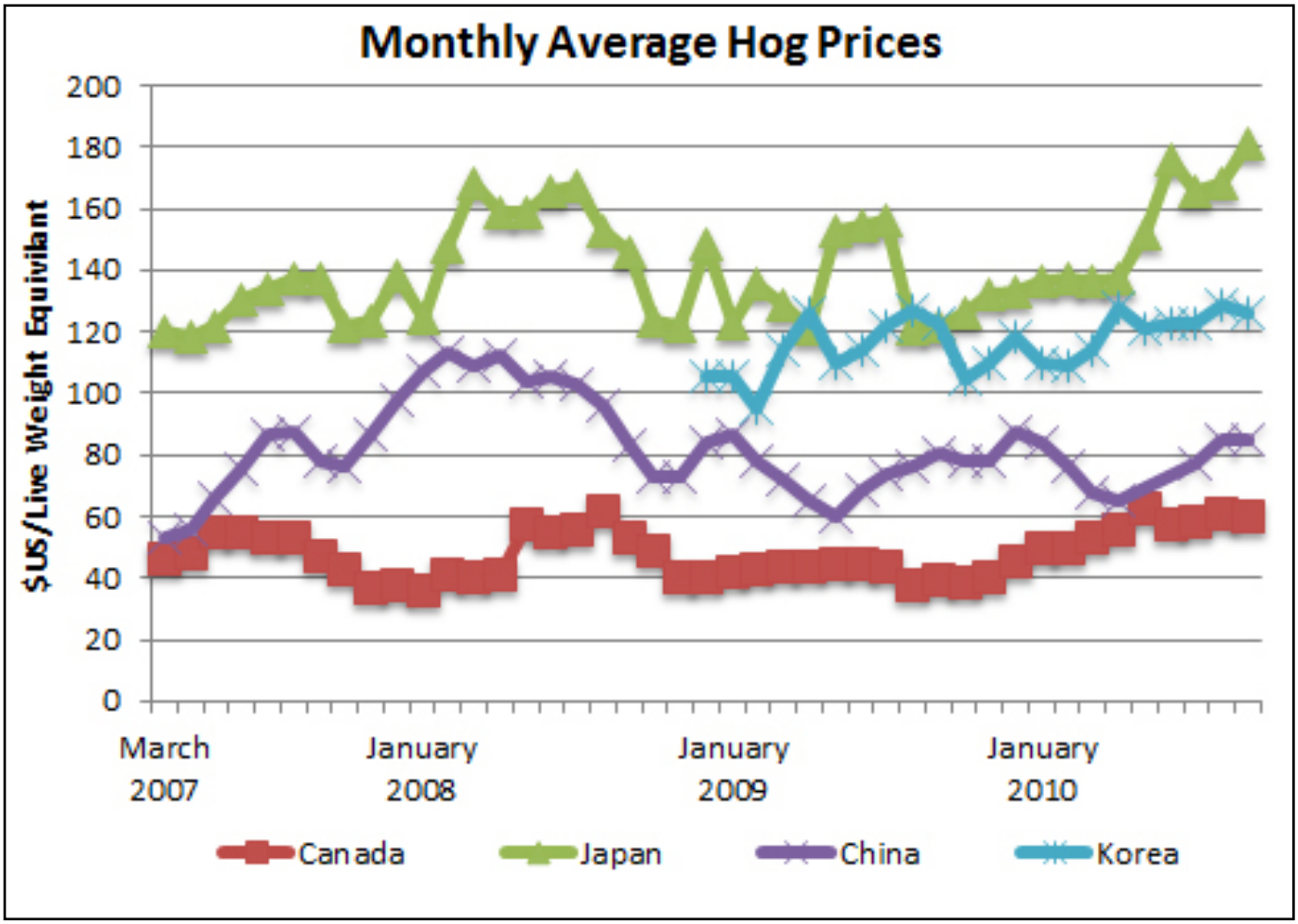
Figure 21 contains prices for live hogs in Canada, China, Japan, and Korea from 2007 through 2010.[28] This is the time during which the "perfect storm" described above lashed the Canadian pork industry. In 2007, prices in Canada were approximately $40 per hundredweight (cwt), while they were $80 in China. In fact, the average difference for 2007 to 2009 is about $40 per cwt.

In Canada, a live hog is marketed at approximately 250 pounds; this means when prices are $40 per cwt in Canada hogs are worth about $100 each. At the same time, the same hog would be worth $200 in China. Note that during the entire period, prices were even higher in Japan and Korea.

In a market characterized by relatively free trade and efficient market practices, prices should move together and differ approximately by the cost of transportation. This is because when demand increases in one place, say China, prices rise, thereby giving a signal for Canada to ship more pork there. They should differ by approximately transportation costs because trade (arbitrage) is profitable so long as one can buy in the low-cost market and sell in the high-cost market for more than the cost of shipping. Therefore, trade should tend to move prices together so they differ by transportation costs.

But the numbers prove that these price differences are not explained by transportation costs. According to recent data, moving a 50,000-pound container of pork from North America to Asia costs approximately $11,000. Depending upon the actual product shipped, this yields a cost of between $5.50 and $8.50 per cwt. There may be additional handling costs, but they do not add up to $40.

Figure 21 Live hog prices in select countries



Source: USDA, Agriculture Canada, MAFF

The rest of the difference is explained by tariff and nontariff barriers that keep Canada's products out of Asian countries. The prices in Figures 20 and 21 do not move together in Asian countries and Canada, nor even among the Asian countries themselves, a clear sign that substantial trade barriers exist between countries.

So the most fundamental problem that affected the Canadian pork industry during the late 2000s was a lack of market access to the very markets where demand is increasing. Opening markets for pork in Asia would have prevented millions of dollars in losses for Canadian hog producers, saved millions of dollars of taxpayers' money not spent on assistance for hog producers, and most likely meant a growing industry instead of one in decline.

Interestingly, this gap began to disappear more recently, as the 2010 data shows, because of new production problems in Asia.[29] This can be viewed in two ways. One is that Asian countries are quick to buy our product when they have a shortage, but not with the consistency required for our industry to sustain itself in that market over the long term. The other is that Canadian governments have not been able to secure access to the most lucrative markets in very high-cost producing countries. This will be examined in depth in our forthcoming paper on trade policy.

Some of the adjustment in the beef industry is more understandable. The Bovine Spongiform Encephalopathy (BSE) crisis in 2003 resulted in prolonged losses for beef producers and a prolonged period when many countries limited Canadian beef imports. The early impacts of the BSE crisis also resulted in too little packing plant capacity to be able to slaughter all the beef and dairy cows that were available.[30] Therefore, the beef herd increased in 2004 and 2005.

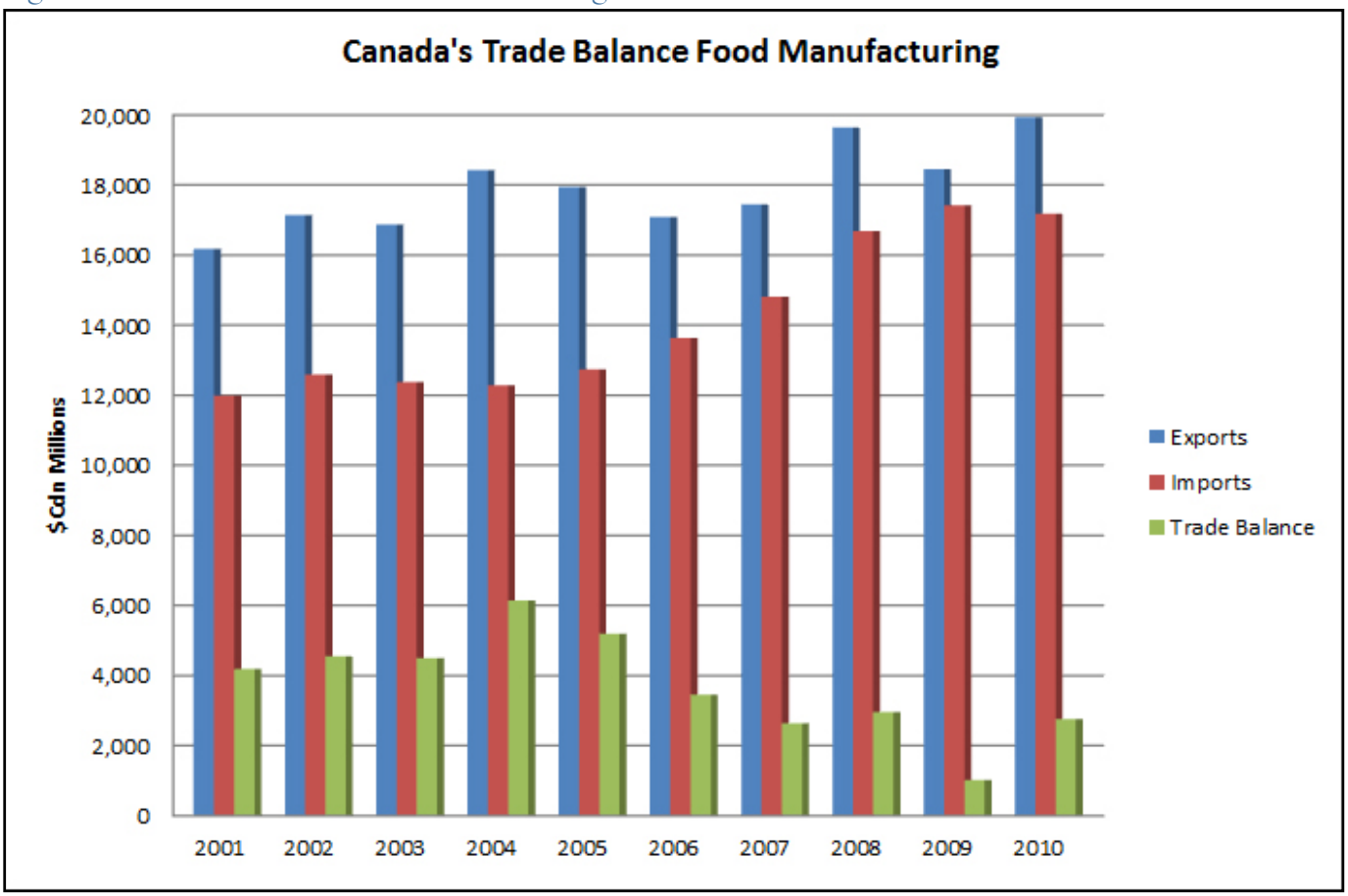
Beyond that, the same factors of access to foreign markets for pork apply to the beef industry.

Trade in Food Manufacturing

The trade problem for Canada is not just at the farm level. Issues are at least as serious in food manufacturing. Figures 22 and 23 show Canada's net trade in the food and beverage industries during the past decade. The figures do not show Canada's share; they show exports, imports, and net trade. Net trade is used here instead of market share because in specific product categories it is much more difficult to reconcile product definitions across all countries.

The difference between the two Figures is that Figure 22 shows just food manufacturing, while Figure 23 includes beverages. The former indicates that Canada's imports of manufactured products grew from just under $12 billion to $17 billion during the past decade, while exports grew only from $16 billion to $20 billion. As a result, Canada's balance declined from the $4 billion-$6 billion range down to about $2 billion.

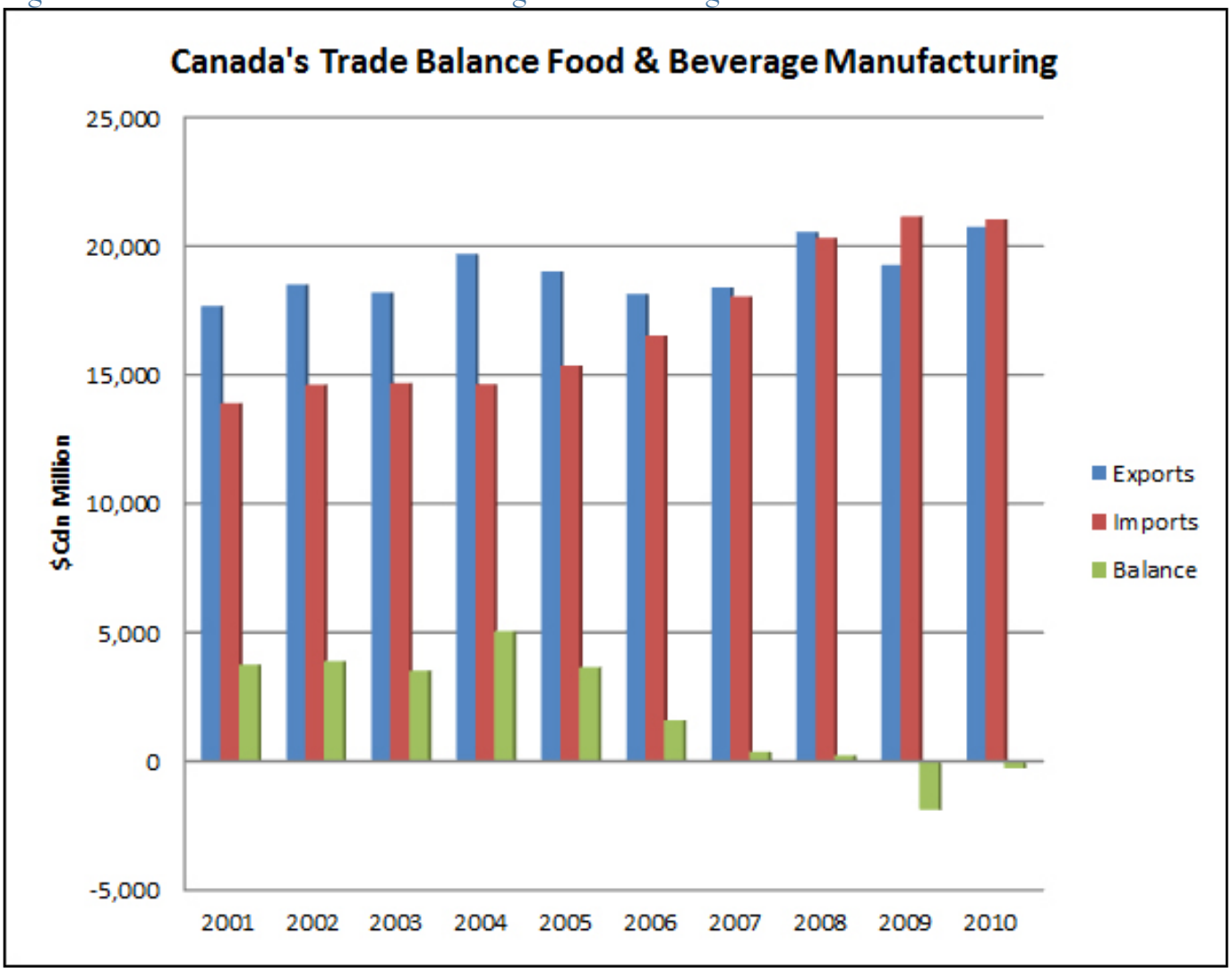
Figure 22 Balance of trade food manufacturing



Source: Industry Canada, Trade Data Online

When beverages are included, the changes are even more dramatic: Canadian imports rose much faster than exports. Net trade declined from a balance of about $5 billion positive to as much as $1 billion negative. Both sets of data indicate that Canadian net trade in manufactured food products declined substantially over the past decade.

Figure 23 Balance of trade food and beverage manufacturing



Source: Industry Canada, Trade Data Online

Lagging Productivity

When industries or countries lose market share and competitive advantage, the decline is usually explained by a loss in productivity. Productivity is output per unit of input. But most available measures of productivity in primary agriculture focus only on physical input/output.

What unit of input is appropriate to use when productivity is calculated? Traditionally, in plant agriculture, the measure used is yield per acre. This measure, however, does not take into account water or degeneration of the soil. Those factors must also be incorporated as part of the way productivity is measured.

Productivity often measures only physical input/output – kilograms per hectare, or milk per cow, or cases produced per hour of plant operation, for example. But increasingly food demand is driven by other attributes – whether the food is produced locally, or with a clean bill of health, or whether it is sustainably produced, for instance. Also within all categories of food, brand names and brand promises have value.

The list of potential ways that value can be added is immense. The point is that productivity has, or should have, a value component that goes beyond physical productivity. Non-physical innovation creates this value. Including this concept in measures of productivity acknowledges that the strategies of many producers and companies have a differentiation component beyond their status as a low-cost producer.

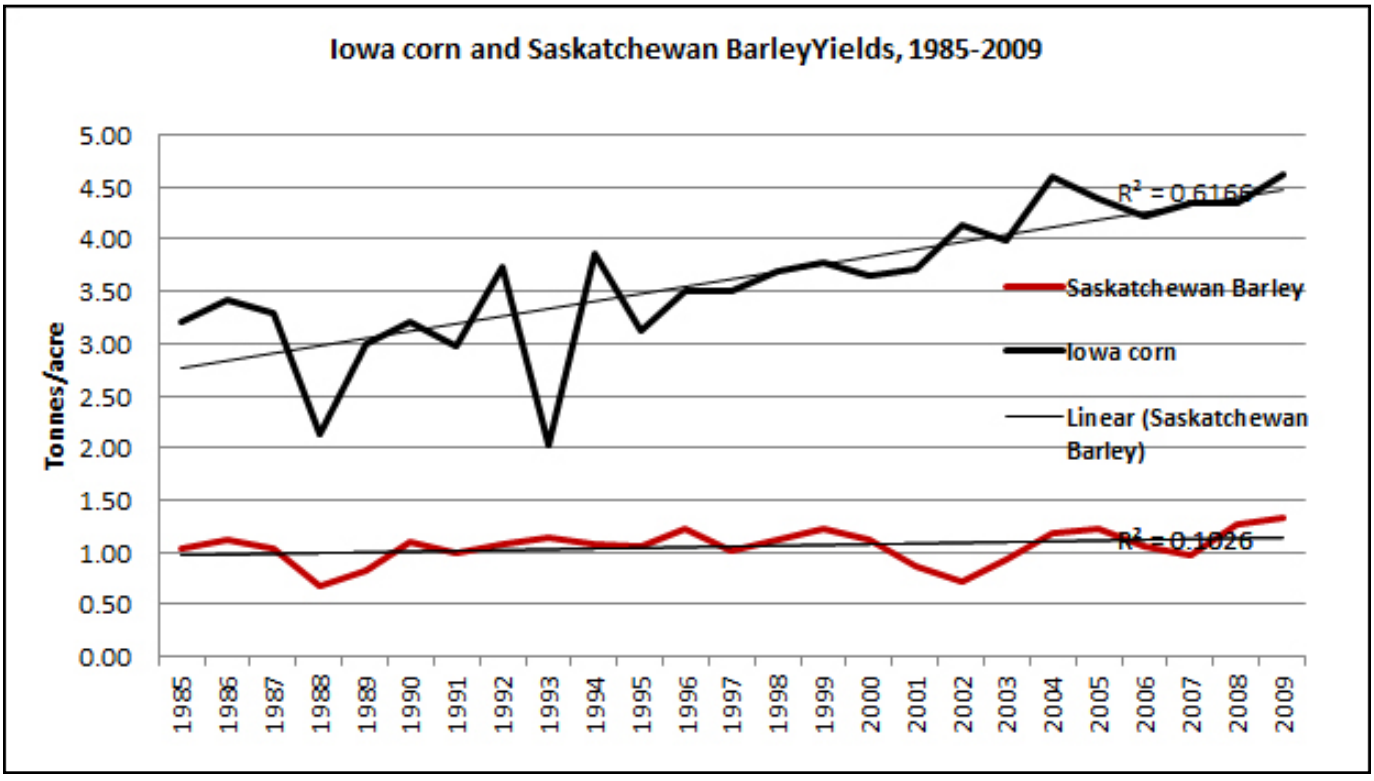
The difference that this can make is enormous. Western Canada, for instance, could always produce rapeseed efficiently. But it produced very little until a genetic breakthrough enabled production of a higher-value oil from the grain. This innovation took rapeseed from its status as a very minor crop to a new ranking for canola as the second-highest acreage crop in Western Canada.

Productivity in Primary Agriculture

Canada's loss of market share in barley and wheat was noted earlier, as was the gain in pulses. Figures 24, 25 and 26 indicate part of the reason why; they also have implications for the lost market share in livestock.

Figures 24 and 25 show barley and wheat yields in Alberta against corn yields in Iowa. The message is pretty clear: corn yields have increased by more than 50 percent since 1985, while barley and wheat yields have barely changed. Figure 26 contains corn yields for Ontario against Iowa. The spread here is much closer, but widening; the same is true for pulse yields.

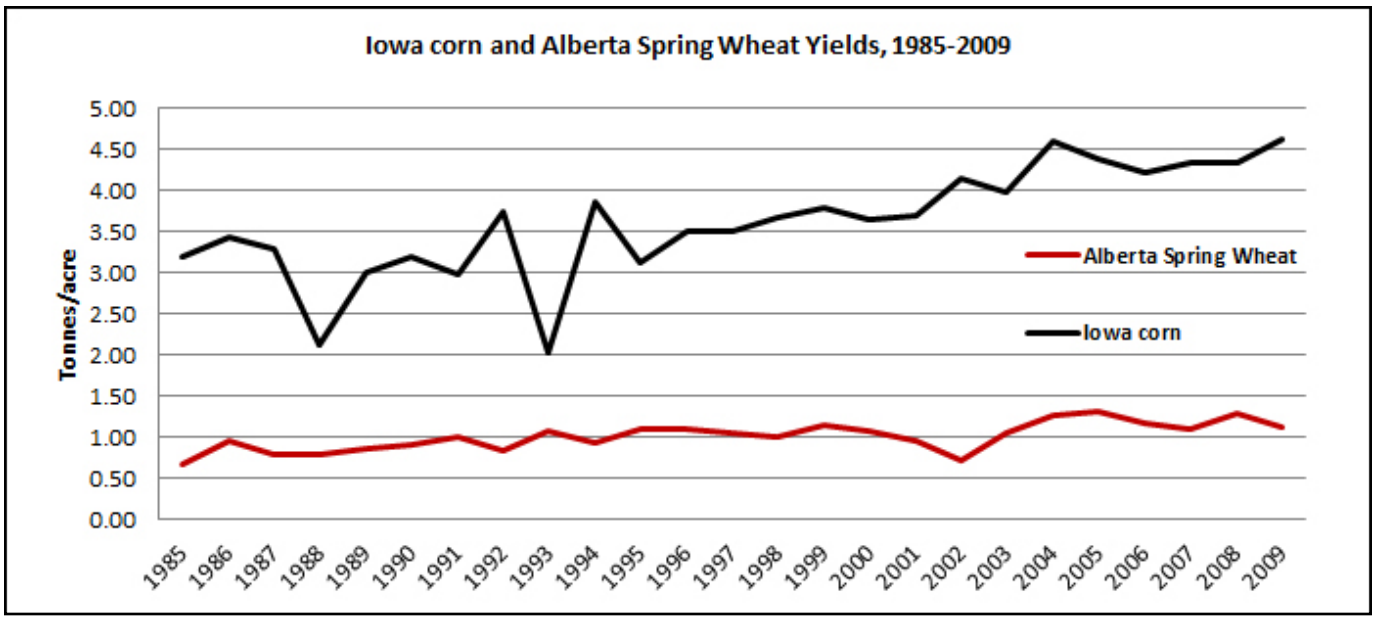
Figure 24 Iowa corn and Alberta barley yields, 1985-2009



Source: Statistics Canada, Cansim Table 001-0010, USDA- NASS Database

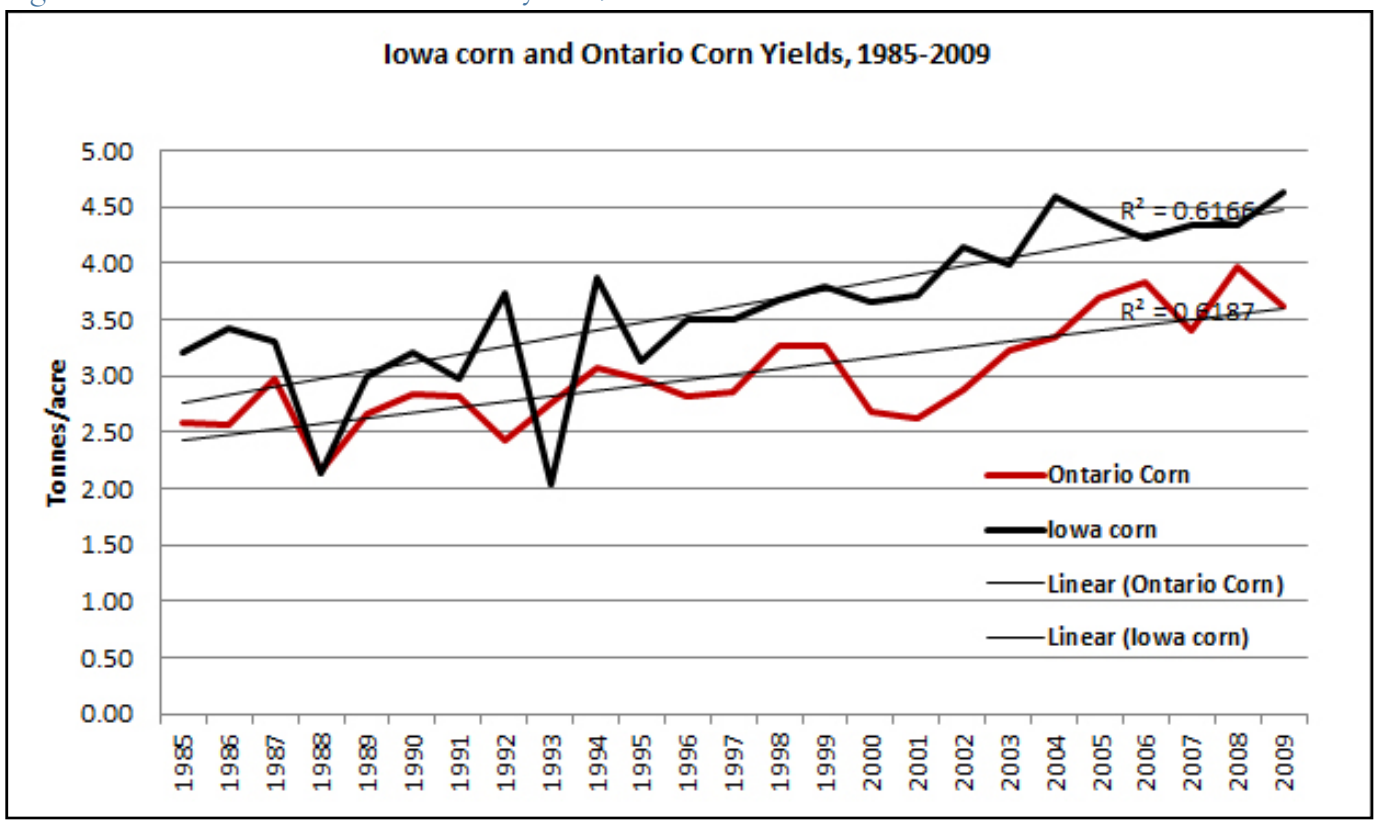
Both the causes and implications of the lack of productivity in barley and wheat are quite substantial. Many in the plant-breeding community contend that they do not invest in breeding research in barley and wheat because of Canada's policy on plant breeders' rights. The inability to get new varieties registered results in part from an almost century-long fixation on something called Kernel Visual Distinction (being able to recognize a type of wheat with the human eye), a concept that technology has rendered irrelevant and rather ridiculous.[31] A host of other regulatory burdens also prevents improvements in productivity.

Figure 25 Iowa corn and Alberta spring wheat yields, 1985-2009



Source: Statistics Canada, Cansim Table 001-0010, USDA- NASS Database

Figure 26 Iowa corn and Ontario corn yields, 1985-2009



Source: Statistics Canada, Cansim Table 001-0010, USDA- NASS Database

The Canadian barley market is characterized by a truly Byzantine pricing system, managed by the Canadian Wheat Board, that creates an incentive for lack of productivity. The system decides after the fact which acres of barley qualify as malt barley. Malt barley carries a significant premium price. Roughly 80 percent of the acres planted to barley are planted as malt, but only 20 percent are chosen. The remainder goes into the feed supply. Barley qualifies for malting if, among other things, it has low-protein. Therefore, it is best to not apply much nitrogen when it is planted, but not applying nitrogen reduces yield. In other jurisdictions malting companies contract directly with farmers to acquire their requirements. These other jurisdictions do not require planting four times as much acreage as is sold. The result is that Canada's yields are lower than if a contracting system was used. In the case of wheat, two additional issues arise. The first is a decision (or non-decision) by regulators to disallow genetically engineered varieties of wheat in Canada while competing crops benefit from genetic engineering. The second is that wheat is one of the most genetically complex organisms in existence. It is perceived that genetic research on wheat will be more difficult than on the much simpler corn and soybean plants.

Taken together, these factors have meant almost no innovation in wheat and barley markets in Canada. The differences in yield patterns for canola and pulses partially explain their substitution for wheat and barley. In addition, many growers in Western Canada attempt to avoid growing Wheat Board crops because of the pricing mechanism for wheat and barley, as well as the regulation and control by that institution. Finally, oilseed prices have risen more over the past five years than have wheat prices because of international demand.

Higher yields usually mean lower costs per unit. Add this to favorable prices, and farmers tend to follow the money. What may be as significant is the impact this phenomenon has had on the livestock industry, especially pork.

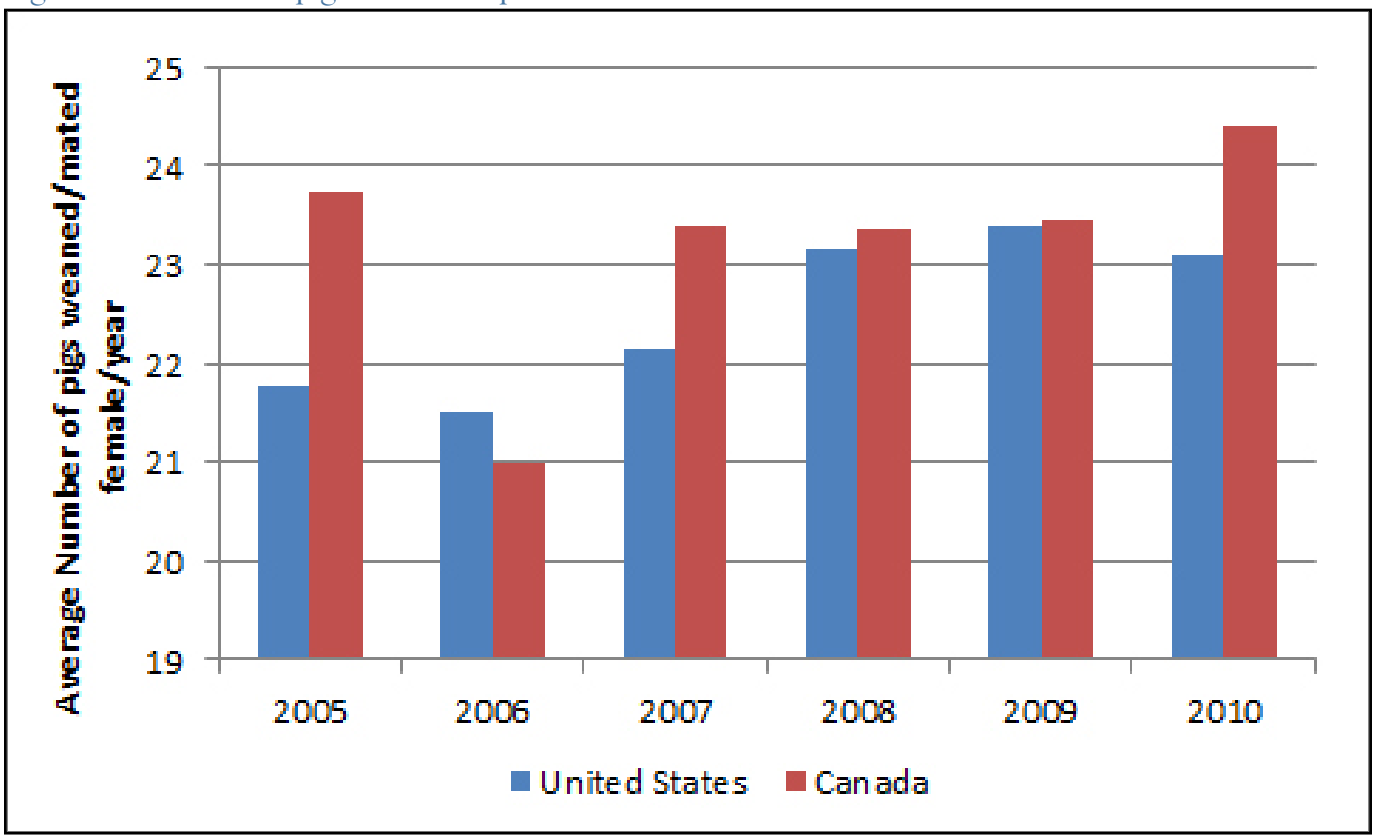
August 1, 1995 marked a milestone in Canadian agricultural policy, when the government of Canada ended the Crow Rate, an almost century-long transportation subsidy for grains from Western Canada to the lake head or to West Coast ports. The expected impact of removing the transportation subsidy was to lower grain and oilseed prices in the Prairies relative to the world market price. This was then seen as a potential boon to the livestock industry because it would lower the cost of feed.

Indeed, studies[31] concluded that, after the subsidy was removed, Western Canada was the lowest-cost producer of pork in the world. What that research did not anticipate was the fact that Canada would fall so far behind other jurisdictions in feed grain production.

If input prices are constant, higher yields mean the cost per tonne declines as yields rise. Therefore, increasing yields in the United States as well as Argentina, Brazil, and other competitor countries mean that they all have gained a cost advantage in terms of producing feed grains relative to Canada since the mid-1990s. Obviously input prices are not constant, but the argument still fits. So, one of the factors that contributed to Canada's rise and then fall in the pork industry was the failure of the feed grain industry to maintain its cost advantage.

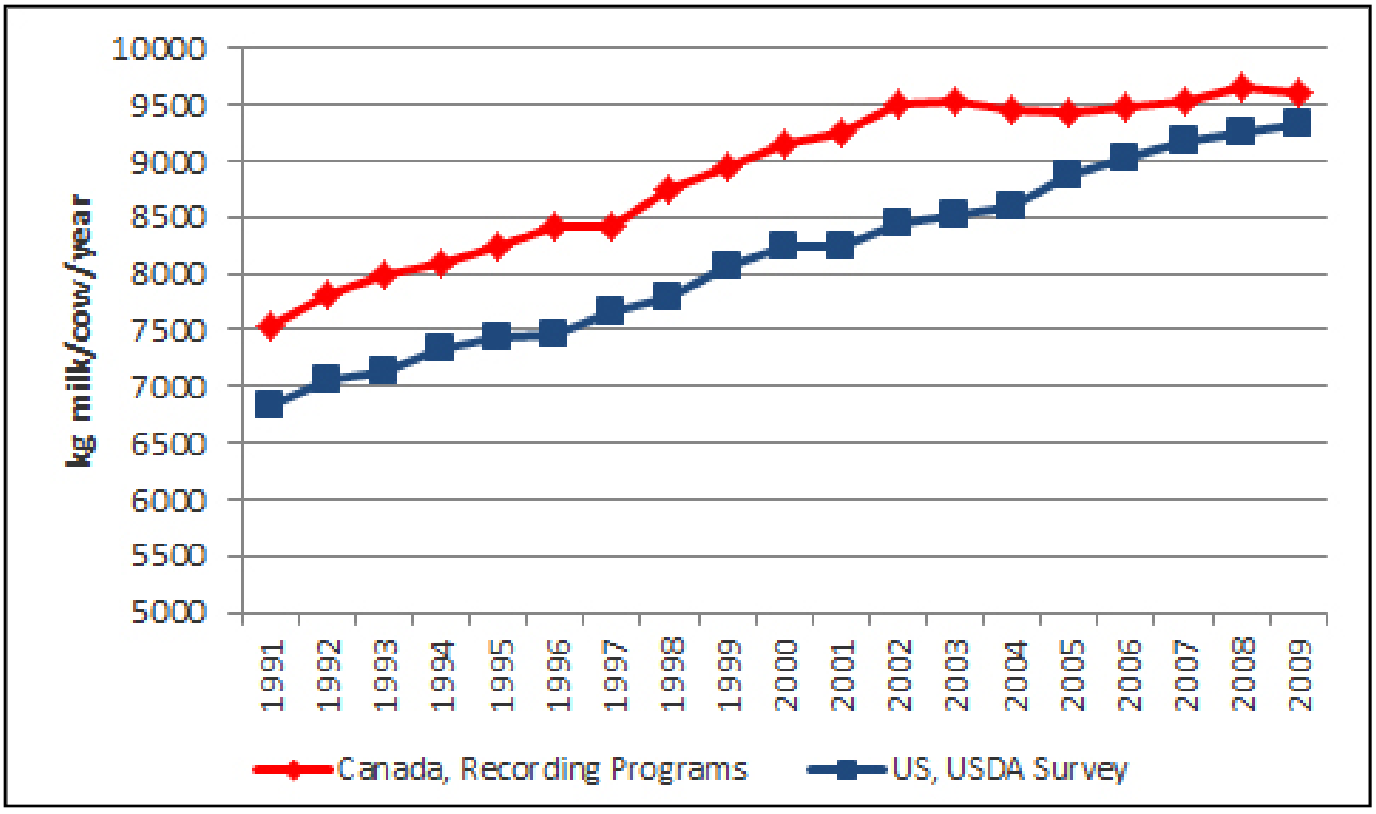
Relative Canadian physical productivity has declined in other products in addition to wheat and barley. Figures 27 and 28 show the number of piglets weaned per mated sow in Canada and the United States and the average amount of milk produced per dairy cow in the two countries. Both show that Canada had an advantage and has essentially lost it.

Figure 27 Number of piglets weaned per mated female in Canada and the United States



Source: PigChamp Software

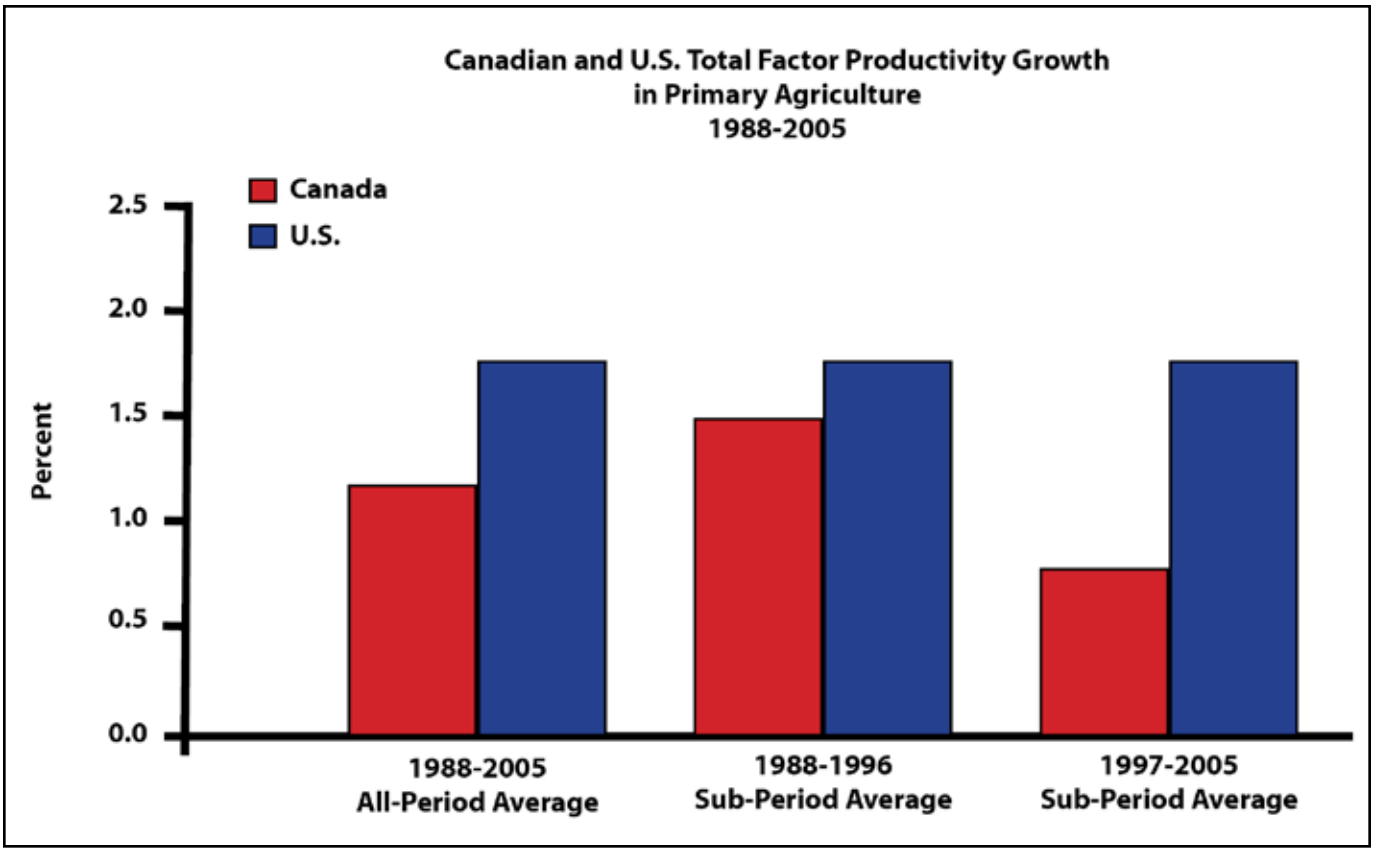
Figure 28 Milk production per cow



Source: AAFC, USDA- NASS

These individual indicators of productivity are consistent with the one study that has examined overall productivity in Canadian agriculture. Figure 29 contains the summary.

Figure 29 Agricultural productivity



Source: AAFC

The study examines "multifactor" productivity: in other words it examines output relative to a bundle of inputs, not just one. The message from the graph is that Canada's productivity lagged the United States' during the decade ending in 2004, and the lag was greater in the second half of the decade than in the first. As stated earlier, productivity in food production will need to rise by 1.75 percent per year to successfully feed a more affluent population by 2050. Canada's productivity growth does not achieve that rate.

Productivity in Food Processing

Food processing is the second largest manufacturing sector in Canada, behind transportation equipment. In 2009, food manufacturing accounted for 15.4 percent of total manufacturing shipments in Canada, at $82.5 billion. The sector is comprised of over 8,000 establishments and employs just fewer than 222,000 people. The sector is centered in Ontario and Quebec – which house 54 percent of the establishments manufacturing food, followed by the Prairies at 19.8 percent, British Columbia with 13.4 percent and the Maritimes with 12.8 percent.

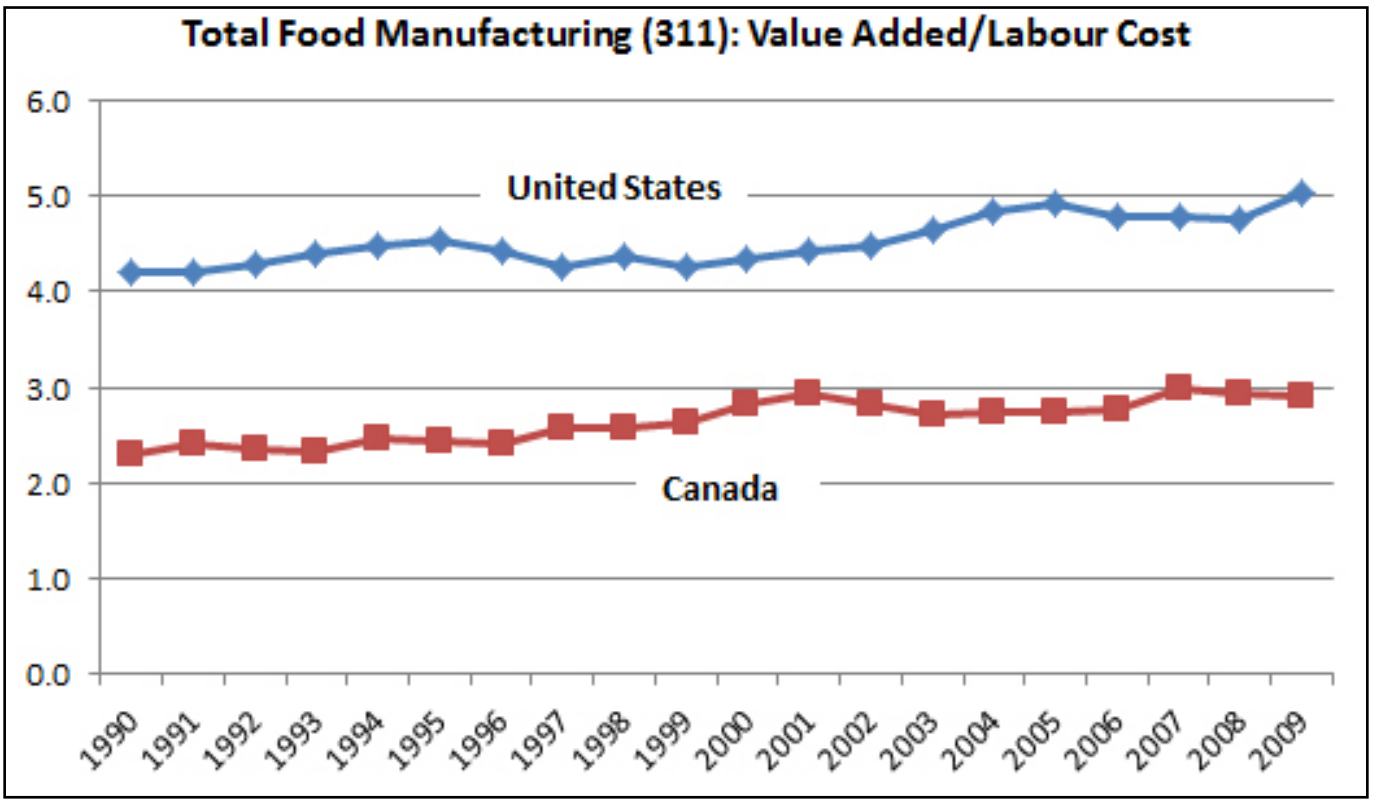
Growth in the Canadian food processing sector is dependent on the sector's competitiveness relative both to other sectors in the economy and to the food processing sectors in other countries. That is true because the food industry must compete with all of those industries for capital and labour.

The George Morris Centre has compiled an overall measure of productivity for food manufacturing, and updates it regularly.[32] The intent of the measure is to reflect productivity within the food industry with effects of the productivity of its supplier industries removed.

The starting point is value-added, defined by Statistics Canada and the United States Department of Commerce as the difference between the value of an industry's sales revenue and the cost of raw material. Included in raw material is the actual raw material, energy, and packaging costs. Therefore, value-added is operating profit before the cost of labour and capital. The value added then is expressed as a ratio of labour costs, including both operating labour and management. This gives the amount of value added per dollar of labour expenditure. It therefore is a measure of how much is left over after paying for raw material, packaging, energy, and labour to pay for capital and innovation.

Figure 30 shows the result, a measure of food-processing productivity in Canada and the United States. Productivity in Canadian food processing has consistently fallen short of the United States, and in 2008 was only two-thirds of the American level. That means that, after paying labour, US food manufacturers have almost two dollars more per dollar of labour to return to investors. Unfortunately, this problem appears to be self-defeating: the lack of profitability implied by this low productivity means the industry has difficulty attracting the capital with which to improve its relative productivity.

Figure 30 Food processing productivity in Canada and the United States[33]

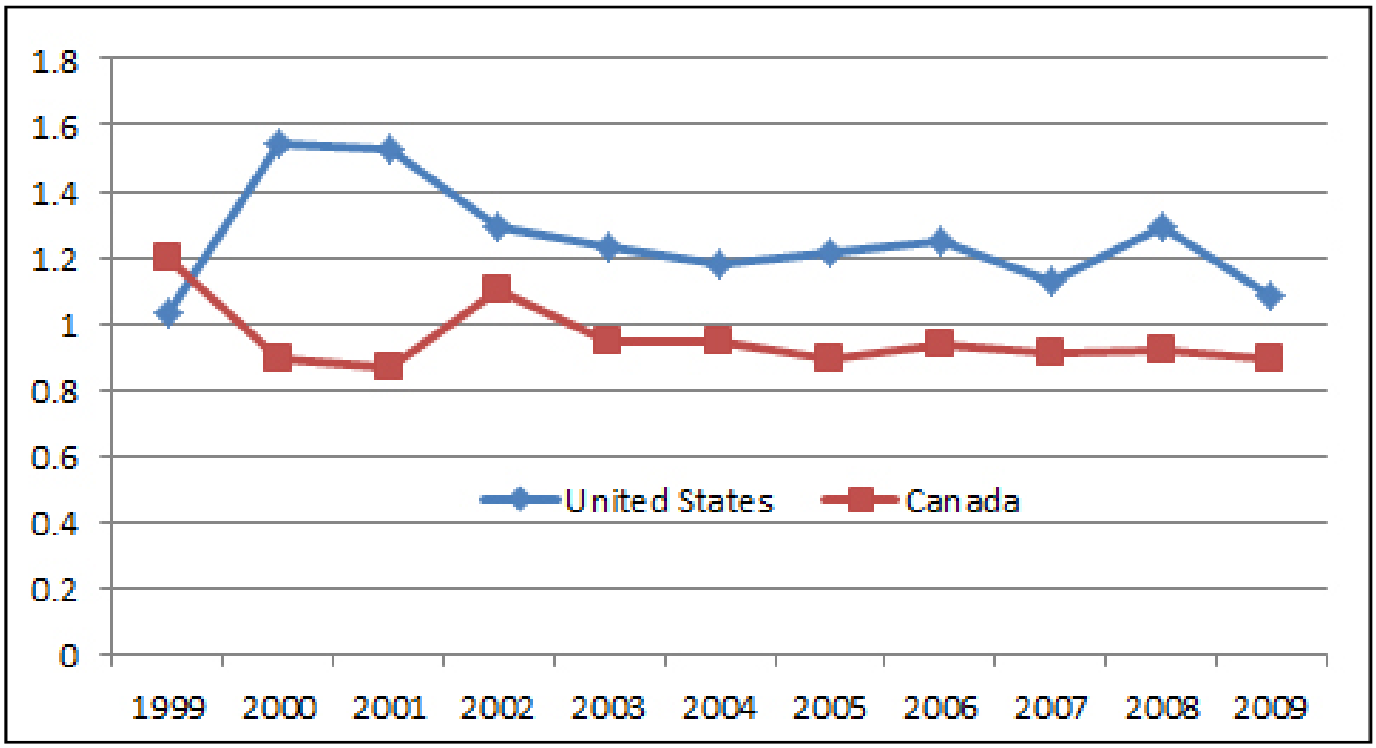


Source: Source: US Annual Survey of Manufactures; Canadian Annual Survey of Manufactures and Logging, U.S. Economic Census

This conclusion is also apparent from the data in Figure 31. It shows annual new investment in the food industries of the United States and Canada as a ratio of annual depreciation. To aid in interpretation of the data: if the ratio is 1.0, then investment is just equal to depreciation, and there is no growth; if the ratio is greater than 1.0, then new investment exceeds depreciation and the industry is growing. If, on the other hand, the ratio is less than 1.0, then the industry is disinvesting.

The Canadian performance is quite clear. In only two of the past 10 years has the ratio been greater than 1.0. Overall, the last decade has been one of disinvestment; cumulative investment has been less than cumulative depreciation. Contrast that with the United States, where the ratio of new investment to depreciation has only dipped below 1.20 on three occasions.

Figure 31 Investment as a ratio of depreciation: US and Canadian food manufacturing industries[33]



Source: US Annual Survey of Manufactures; Canadian Annual Survey of Manufactures and Logging, U.S. Economic Census

What's the Problem?

First, a summary of the information already presented:

- Recent past growth in world food demand has been exceptional and will likely continue for the foreseeable future, if income growth in developing countries continues at relatively high rates. Nearly three billion people in the world have not yet come into the middle class, and another 1.5 billion recently moved up. People with relatively low incomes have a very high propensity to buy more food as they receive more income.
- The world's ability to produce more food will be challenged because of a declining endowment of arable land per capita, absolutely declining amounts of fresh water, and degradation of soil fertility.
- Canada is well positioned with its resource base, infrastructure, and knowledge, to take advantage of this growth.
- Despite its advantages, Canada has lost market share in almost every major product category; it lags in productivity both in primary agriculture and in the food industry.

Why the gap between Canada's performance and these opportunities? As with most questions of the sort, the answer is not simple and has many dimensions.

Canada's Size, Shape, and Mentality

A fundamental problem facing any Canadian manufacturer is that Canada has a relatively small population, the majority of which is spread out along the nearly 9000 km Canada-US border. This creates challenges in competing with a behemoth like the United States.

From a cost perspective, huge economies of size intrude. Most parts of the United States have 35 million people within a one- or two-day drive; not so in Canada. The issue is not geography but rather market access. The Americans can more effectively build large specialized plants that produce and distribute products to a large number of people. Many Canadian plants have much higher distribution costs, thereby limiting their economies of size. Canadian plants tend to be less specialized in manufacturing; they need to produce more products to minimize distribution costs to a smaller and geographically dispersed population.

It is therefore inherently more difficult to achieve high productivity in Canada. This is in part due to the fact that Canadians have rarely been able to achieve the product mandates or market penetration in the United States that would give them the opportunity for economies of size. This problem has been exacerbated since 9/11 because of security issues at the US border.

The inability to secure consistent market access in the United States is one aspect of a larger problem alluded to in the previous discussion of Canadian pork exports and hog prices. Because of our small population and its geographic distribution, Canadian manufacturers need to access export markets in order to achieve economies of size. In most industries, Canada's population alone simply cannot support world-scale plants. More so than Americans, we need to export.

Until recently, we have seen very little emphasis on the importance of market access. And while we have seen recent lip service paid to that need, it is not at all clear that a coherent export strategy is in place for negotiating or securing this access. For example, while NAFTA offered significant gains to Canada, our NAFTA partners have been much more aggressive in developing regional and bi-lateral trade agreements that have, in turn, diminished the NAFTA benefits for Canada. Many of those agreements are with countries that have rapidly growing food demand. Developing a clear and rational trade strategy is a fundamental necessity for our future policy.

An additional issue for Canadian manufacturers and producers is exchange rate risk. Most international trade is conducted in US funds, while most costs are incurred in Canadian funds. Moreover, the trend in the Canadian dollar against the US dollar has been upward in the last several years, which decreases revenue in Canadian funds and increases costs in US funds. This has led to additional difficulties in achieving improved productivity because a rising currency simultaneously puts pressure on Canadians to increase productivity, and weakens our capacity to invest in productivity gains.

Another aspect of Canadian policy that affects productivity and scale is a preoccupation with small operations. Both inside agricultural policy and outside, many programs, sometimes with direct government investment, aim to increase the number of small operations. This reduces our competitive advantage and directly and indirectly reduces the amount of capital available for investment.

These are the typical excuses that Canadians use for why our productivity is lagging. Conversely, the lack of product mandates to create economies of size in specialized plants means that Canadians are far better at flexible manufacturing, for which there is international demand. Fluctuating exchange rates are manageable, and present just as many opportunities as problems. Learning how to manage exchange rate risk can be a competitive advantage in an increasingly volatile world.[34]

Canada's Agri-food Regulatory System

It is a fundamental requirement that Canada's food sector and the regulatory bodies that govern it deliver safe foods for Canadians and consumers abroad. It is also a fundamental requirement that the regulatory system be operated such that those who supply products can do so efficiently and are encouraged to innovate, including innovations of healthy, safe food products and production practices.

Many studies have shown that, unfortunately, the current regulatory system administered by the Health Canada/CFIA bureaucracy is a burdensome cost and a tax on innovation in the agri-food sector. Decisions on regulatory applications in Canada can take three to five times as long as in competing countries. Because Canada is a relatively small country, this discourages companies from introducing products in Canada and makes Canadian producers and processors higher cost than their competitors. These delays produce no discernible benefit in safety, but do create a huge difference in costs for a country relatively small in terms of the size of the potential market. The result is a net flight of research from Canada, as well as an increasing gap in the ability of farmers, food companies, and consumers to produce and acquire safe, efficient, and effective products.

The issues that plague this system span all three of its components, i.e., the legislation that creates it, the regulations developed by the system, and the administration of those regulations. They affect a wide swath of the sector through regulatory approvals for pesticides and animal health products, seed registration, new food approvals, and health claims, as well as costly and arbitrary procedures. While marginal progress has been made to reduce the burden in a few areas, the overall system remains a quagmire.

Canada's regulatory system needs to be modernized. First, it requires a legislative framework that incorporates objectives for human, animal, plant, and environmental health protection, fosters innovation in agri-products, and promotes efficiency in the food system, as it is in the legislation of competitor countries.

Second, the efficiency of the regulatory approval process in Canada is affected by the level of regulatory oversight and regulatory amendments required for approval. For example, when a company wants to introduce a new pesticide product in Canada, whether conventional or biological, the Pest Management Regulatory Agency requires that the company prove not only the safety but also the efficacy of the product prior to its approval. Proving efficacy means that the registrant must prove that the product does what it claims it does, rather than facing legal liability for making claims that cannot be met, as is the case in other countries. This requirement alone means a much longer process in Canada. Another example: often, when a food company introduces a new food additive, novel food, or health claim, a time-consuming regulatory amendment is required prior to marketing of the product or claim; these are not required in other countries.

This increased regulatory oversight leads to a decreased number of product approvals pursued and/or approved, which in turn leads to more limited opportunity for innovation. In a market that is considered minor compared to the European Union, this creates an additional disincentive for companies to pursue product approvals at all. It also means that older formulations of pesticides, more dangerous than the newer ones, often remain in use in Canada.

Third, given that the system is so reliant on regulatory oversight, it requires a clear and transparent administrative process. Studies[35] have clearly shown that in Health Canada's Food Directorate, the Pest Management Regulatory Agency, or the Veterinary Drugs Directorate, substantial changes in administrative procedures are needed to speed up and improve their administrative processes.

Even as it calls for reform, the agriculture and food industry is struggling to work within this regulatory environment. Without regulatory reform across the board, producers and agri-food companies are not able to respond effectively to new market demands and develop new and innovative foods, utilize newer, more effective, and safer pesticide and animal health products, or develop new, higher-yielding seed varieties with specific attributes.

Innovation

Canada's research and development capacity is well-developed. But Canada lags in the ability to take this primary research and commercialize it into new and improved goods and services.

The Conference Board of Canada rates seventeen OECD countries each year on their performance in a number of categories, including innovative performance, and measures their capacity.[36] In 2010, Canada ranked 14th of 17 countries and received a "D" in innovation. The Conference Board explained that Canada does not take steps to commercialize science and spend on research and development. The Board also suggested that Canada has "many policies designed to preserve existing industrial production rather than generate new innovative ones", a strategy that leads to a lack of innovation. No evidence suggests that the agri-food sector is better than Canadian production in general.

The Lack of Policy Focus on Productivity and Innovation

A large part of the problem with productivity in primary agriculture, as well as the food industry, is the focus by Canadian governments on what is called "Business Risk Management (BRM) Programs". In most places in the world, these are known as farm subsidies. The reason, of course, for the focus on farm subsidies is that the governments are constantly bombarded by Canadian farm organizations about the plight of farmers. The result is a set of programs that tend to subsidize rural residents who are not commercial farmers and that produce very little income stability.

These are strong statements, but they are accurate. In 2010, Al Mussel showed that, based on 2006 census data and average financial data for the period 2004 to 2008, approximately 100,000 farms in Canada had sales of less than $100,000 per year.

Canadian farms in this range of size have operating earnings of 10-20 percent of total sales.[37] From these operating earnings, people need to pay interest, depreciation (new capital investment), returns to their own investment, and family living expenses. These farms generate $10,000-$20,000 to do all those things. Obviously, this is not a living wage; in fact, average nonfarm income for this group is $42,000 per year. Most of the members of this group are clearly part-time "farmers".

These 100,000 farms had a total net operating income of $359 million: this is 5.7 percent of operating income for all Canadian farms. Yet these farms collected $523 million of taxpayer money under BRM programs.[38] This is 16.2 percent of the total distributed by the government and more than their net operating income. Without these farm payments, this group would apparently have an operating income from farming in the negative, but average or better household income.

In other words, although these 100,000 farms represent 55 percent of the total number of farm enterprises, they generate only 5.7 percent of net operating income and collect 16.2 percent of support payments. Governments and farm organizations would have us believe that policy exists because these farms have a high business risk. But the same entities have about $4.2 billion in income from other sources. While a few of these operations may be legitimate farms, very few of them contribute much to the economy.

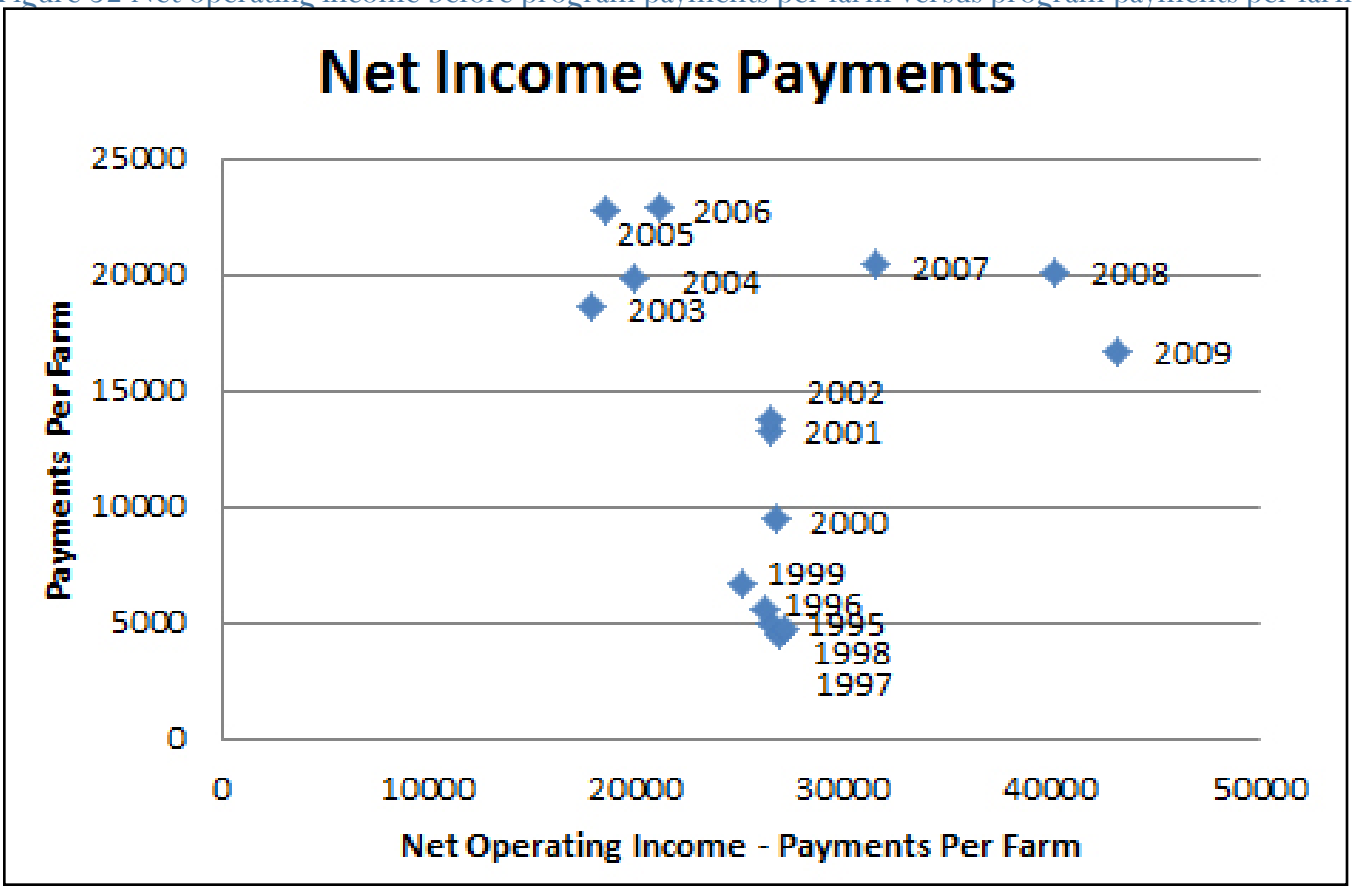
Adding the $100,000-$250,000 category of operating incomes for farms gets us roughly to the 80/20 rule: 78 percent of Canadian farms earn 24 percent of the net operating income in agriculture. They receive 50.9 percent of all farm payments from the government. Total payments are $1.2 billion, while net operating income is $1.5 billion. In other words, for smaller farms in Canada, almost all of their operating income from farming is a result of government payments. A total of 140,000 operations receive $1.5 billion per year. Non-farm income for these farms is about $5.3 billion.

Conversely, this means that 22 percent of farms have annual revenue greater than $250,000. These farms generate 76 percent of net operating income in agriculture and, on average, receive 49 percent of government payments.

Figure 32 shows average net operating income per farm without payments plotted against payments per farm during the past 15 years. The figure shows relatively little correlation between the two sets of data, especially in the last three years, when net operating incomes were high and so were farm payments.[39]

If the objective of a risk management program is to stabilize incomes, one would expect a strong inverse relationship between average net operating earnings and government payments. In years when net operating earnings are low, government payments would supplement them, thereby creating stability. Conversely, in years of high net operating income, no government payments would be required. The figure shows quite clearly that some of the largest payments occur in the years when net operating income is the highest.

Figure 32 Net operating income before program payments per farm versus program payments per farm



Source: Statisitcs Canada

Finally, we calculated the standard deviation of the average net operating income per farm before and after government payments. The standard deviation is a measure of variability in a set of data; the larger the standard deviation, the greater the variability. In this case, the standard deviation without payments is about $6840 per farm, while with payments it is $9440. In other words, the variability is about 40 percent higher in absolute terms when payments are included. In other words, there is more variability as a result of government payments than there is without them.

A detailed look at the relationship between government payments and farm incomes in Canadian agriculture, to repeat, shows that the effect of the BRM programs is different than the stated objective. Half of the money goes to smaller operations that generate very little net operating income from agriculture, but who generate a large amount of income from non-agricultural sources. Nothing of importance is discernibly stabilized as a result of these stabilization programs.

Canadian taxpayers paid farmers about $3.5 billion per year during 2004-2008. In addition, unlike other countries, especially the European Union, these income programs contain no cross-compliance requirements that reward farmers

for increasing productivity or innovation, or for enhancing environmental stewardship or management skills. The lone exception to this is production insurance, which incentivizes farmers to manage their production risk well.

Productivity and innovation are both lagging in Canadian agriculture. The link between the failure of income support programs to enhance sector performance and those indicators needs more examination.

Agricultural Trade Policy

The earlier discussion about access to Asia for Canadian pork illustrates the critical importance of market access, as do parts of this report. In the Canadian food processing industry, to bring back another example, productivity lags in part because we are unable to attain economies of size; because of the small and scattered size of the domestic market, the only way for Canadians to attain economies of size is to access larger markets. This obviously requires trade access.

Since the Canada-US trade agreement and NAFTA, one could characterize Canada's agricultural trade policy at best as tentative. We have seen no bold moves on bilateral or regional trade agreements, at least until it became clear that everyone else in the world was pursuing them.

Further, Canada's position in the Doha Round of World Trade Organization (WTO) negotiations has earned us censure on two occasions because it hampered progress. In any case, Canada has certainly not been a force to find a compromise position that would move the multilateral negotiations forward, as Canada has done in the past.

Opinions differ tremendously on the importance of multilateral agreements. Those who believe they are central to a Canadian strategy, including the authors of this report, think that small countries have much to gain because multilateral negotiations constrain the behavior of large and powerful trading entities such as the United States, the European Union, and Japan. The benefits of strong legal rules and disciplines can be demonstrated by a number of decisions that have been made in WTO disputes.

Canadian Trade Agreements

Multilateral Agreements:
- Member of WTO: Jan 1995*

Bilateral Agreements:
- NAFTA: 1992
- Chile: 1996
- Israel: 196
- Costa Rica: 2001
- EFTA Member States (Iceland, Liechtenstein, Norway, Switzerland): 2008
- Peru: 2008

Bilateral Agreements Signed but Not In Force:
- Colombia: 2008
- Jordan: 2009
- Panama: 2010

* Date of Signature

The opposing argument is that, in a sense, the WTO is a victim of its own success. It tends to negotiate the removal of traditional trade barriers such as tariffs, import quotas, and export subsidies. Some would argue that it has done such a good job that we now have more barriers to trade of the non-tariff variety, ones that are not addressed by the WTO. Therefore, the WTO and its rules are increasingly irrelevant to the existing constraints to trade. An additional argument is that many developed, exporting countries have already reduced traditional barriers such as direct production subsidies and export subsidies, and that little more would be accomplished in practicality because remaining tariffs and subsidies contain so much "water" that a new agreement would have little practical impact.[40]

These uncertainties about international agreements, and the conflicting position of various industries within Canadian agriculture, stand in the way of a clearly articulated and practical strategy for improving access to markets. The conflicting position within Canadian agriculture is, of course, the difference between the positions of the export oriented sectors such as livestock/meat, grains and oilseeds, and some parts of horticulture on the one hand and the dairy and poultry industries on the other.

Canadian dairy and poultry industries adopted an approach called supply management in the late 1960s and early 1970s. It controls domestic production, limits imports with very high tariffs, and gives producer organizations the power to set prices within their own domestic markets, based in varying degrees on "costs of production". Domestic producers are assigned production or marketing quotas. Directly or indirectly, the quota is transferable within provinces and it moves

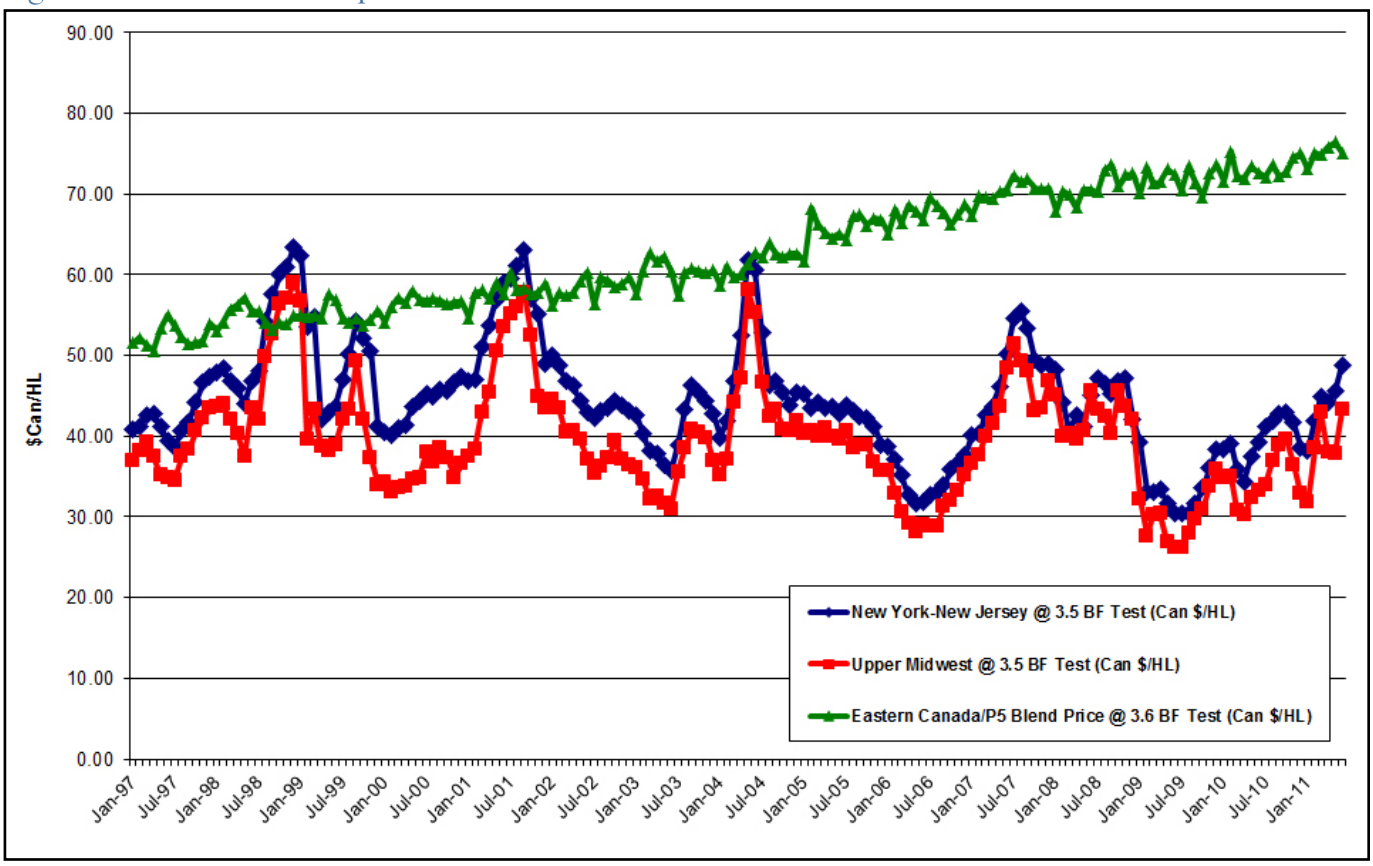
at a price. Producers who obtained quota at the beginning of supply management have been able to sell it either to their offspring or to others, and many of the benefits of the quota are capitalized into costs. The estimated value of dairy and poultry quota in Canada is somewhere between $35 and $50 billion.

Because of supply management in the dairy and poultry industries, Canada is a miniscule participant in the export markets for their products. Canada's domestic prices are generally far higher than world prices for them. Essentially the only exports from Canada of dairy and poultry products are those "byproducts" such as skim milk powder and chicken backs that are surplus to domestic needs at the prices set by the domestic industries.

Critics of supply management point out that its benefits are capitalized into costs. Because of the costs they add and the rules of the system, adjustment to a more efficient scale of operation has not occurred in Canada, and the cost of quota is not included in numbers on the cost of production. The other side of the argument is that supply management raises and stabilizes farm incomes and has protected the ability of "family" farmers to continue to exist.

Nothing illustrates the opposing positions better than the data in Figure 33, which contains the prices for fluid milk in Ontario and two US states. Note that Ontario prices are higher, and are much more stable. At the same time, they also increase relative to the US.

Figure 33 Farm-level milk prices



Source: Canadian Dairy Commission, Milk Marketing Order Statistics Database

The latter fact is indicative of two of the criticisms. First, because Canadian prices continually rose while American prices were declining over the time illustrated, this is an indication that the Canadian system does not take into account potential cost savings from new technology or economies of size until they are long since adopted by others. Second, the increasing gap between Canadian and import prices suggest that the Canadian system takes advantage of tariffs averaging 250 percent. The argument is that lower tariffs would encourage pricing which would, in turn, encourage lower costs in Canada.

No matter who is right, the fundamental issue is straightforward: other parts of the Canadian agriculture and food sector want to gain more access to foreign markets, particularly of the rapidly growing developing nations. Not surprisingly, the dairy and poultry industries are loath to give up their protection because it will threaten the level of economic benefit they gain from supply management.

This led to a resolution passed unanimously by Canada's Parliament that directed Canadian negotiators at the WTO to maximize market access for the products Canada wants to export, but to give up no market access for dairy and poultry. This rather improbable position has made Canada completely ineffective in these negotiations. Estimates[41] by Morgan suggest that Canada faces average tariffs of 75 percent for pork, beef, and dairy products in potential export markets, with some tariffs as high as 300 percent. Obviously, obtaining reductions in these tariffs would benefit the export-oriented industries in Canada.

According to the Union des producteurs agricole in Québec, the most likely outcome, had there been one, of the Doha Round would have been a reduction in dairy tariffs of 23.5 percent over a phase-in period of three to six years. This would have decreased the Canadian dairy tariffs to about 191 percent after the phase-in. In other words, the tariff on a unit of imported product that costs $5.00 at the Canadian border would have been $9.56, making the total cost $14.56. This is, by any standard, a high level of protection.

Chicken tariffs are approximately 238 percent, while turkey and egg tariffs are somewhat lower. They would presumably have been subjected to similar tariff reductions. Supply-managed industries opposed this level of reduction on several grounds:

- The "slippery slope" argument, which basically says, "If we give up anything, people will want more." This argument is emotionally correct, but the context is that nothing more would need to be given up until the next round of the WTO. The last two rounds were spaced well apart and both negotiation processes were conducted for nearly a decade each. Therefore, it would be a long time before the next negotiation.
- There is little reason to believe that other countries would give Canada much market access. Three counter-arguments address this objection:
    - The tariff aspect. There is no evidence from past negotiations that countries do not fulfill their obligations in this regard.
    - Tariff rate quotas (TRQs): Without going into technicalities, this is an amount of imports that each country allows of protected products with no or low tariff protection. The argument has been made in the past that Canada received very few of the TRQs in the previous round. Countries have the right to choose how and to whom TRQs are allocated. Most of the reason Canada got few in the past is because of our reluctance to give access to our dairy and poultry markets.
    - Non-tariff barriers: This argument is that much of what keeps Canadian products out of foreign markets are non-tariff barriers that are not part of the WTO negotiations. Therefore, why would we give up protection on a system that is working well when we may not get much back? This aspect of the argument is correct. The basic issue then is whether the amount of access gained because of lower tariffs and more TRQs is greater or less than what would be lost for dairy and poultry.

Much of this argument now appears to be academic, because very little is expected from the WTO negotiations. What are potentially more concerning are the positions taken in bilateral negotiations. It would appear, from some reports, that the Canada/EU negotiation is having a problem because the European Union wants improved access to Canada's fine cheese market.

Perhaps more important are reports that the United States and Australia do not want to include Canada in negotiations for entry into the Trans-Pacific Partnership (TPP). This is a free trade area that already includes a number of Asian countries and New Zealand. The United States, Australia, and others are asking to join the TPP. Some reports indicate that they oppose Canadian participation because of our position on dairy and poultry.

Some argue that these markets are too small to carry that kind of importance. Whatever the case, if Canada's position on dairy and poultry are obstacles to gaining market access for other products, then we need a clear debate and strategic thinking about our trade strategy.

The current government put the following in its most recent Speech from the Throne: "In all international forums and bilateral negotiations, our government will continue to stand up for Canadian farmers and industries by defending supply management." The question is, what does "defending" mean? If it means giving nothing, many Canadian farmers and industries will quarrel with the definition. If it means preserving a high level of tariff protection and a pricing mechanism that will encourage innovation, it is likely that all farmers will be represented. Hence the challenge for Canada is to find options that can enhance our trade negotiation position. It is to find structures in policy and programs that will assure continued viability of the supply managed industries, stabilize quota values, minimize the devastating asset losses that would accrue to them by simply reducing tariffs materially, and gain market access for the remaining commodities and products.

In addition to its agricultural resource base, one of Canada's strategic advantages is that it has always been a reliable supplier. A number of other countries, including the United States and Russia, have stopped exports when supplies got tight. (This was done most recently by Russia in 2010 when it limited wheat exports.) As international trade becomes more important, and food demand continues to grow, that advantage will open up considerable opportunity. Our defense of supply management provides no such clarity on Canada's strategic intent with respect to agriculture and food trade.

We think Canada can do better. It is time for an open and transparent discussion about what position we want to have in the world.

Epilogue

The title of this paper ends with the words "A Growing Hunger for Change". In the writers' experience, Canada contains a network of people, both among primary producers as well as food manufacturers, who appreciate our evolving potential in the world. In this paper, we have described a very different food market than the one we've observed in the past. The economic emergence of China, India and other developing countries materially changes what will be required. If productivity cannot increase rapidly, the storm of commodity price levels and volatility we've seen since 2006 will appear minor in comparison with what is to come.

Canada's leadership seems not to recognize the possibilities. As Ryan Maurer, one of Canada's Outstanding Young Farmers in 2010, says, "Canada's farm organizations and political leadership continue to try to solve the problems of the 1990s and haven't even begun to address those we will face in the next five to ten years."

People like Ryan are hungry for change. Making agriculture and food needs a national priority is the necessary, fundamental change. The sector needs to be lifted above the petty differences and shortsighted visions of many of those in agriculture. It is time to develop and implement a strong positive agriculture and food strategy for Canada that will make Canada's agri-food sector the envy of the world.

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End notes

[1] The authors are indebted to Ted Bilyea, an agri-food consultant and former President of Maple Leaf Foods International, for ideas and information included in this paper. We are also grateful to Dr. Douglas Hedley and two anonymous reviewers for comments on earlier drafts.

[2] United Nations, World Population Prospects, 2010.

[3] Senior Fellow, Chicago Council on Global Affairs and Professor Emeritus of Agricultural Policy, University of Illinois at Urbana-Champaign.

[4] World Bank, Data, 2011.

[5] Thompson, Robert L. *Global Food Security and Rural Poverty.* Nestlé S.A. 2011.

[6] FAO, 2006.

[7] The European Union has similar policies for bio-diesel: over 60 percent of the European Union's rapeseed (canola) is used in bio-diesel production (FAO, 2009).

[8] Auld, Doug. T*he Ethanol Trap: Why Policies to Promote Ethanol as Fuel Need Rethinking,* CD Howe Institute Commentary #268. Ottawa: CD Howe Institute. July, 2008.

[9] GMC Calculations from USDA-FAS PS&D, 2011, USDA Feed Grains database.

[10] The implications of ethanol cannot be overstated. The essential equation in ethanol production is that a bushel of corn results in about a third of a bushel each of ethanol, carbon dioxide, and distillers dried grains (DDG) (Kelsall and Lyons, 2006). The latter two are by-products of the ethanol production process. DDGs are relatively high in protein and can be consumed by farm animals as a partial substitute for corn and soybean meal. Therefore, only about 2/3 of a bushel of corn used in ethanol production is lost to the food system. At the same time, DDGs are not perfect substitutes in livestock feeds: research and practical experience show that DDGs must be kept at relatively low levels in livestock rations for a number of reasons, including their impact on carcass quality in some species (de Mello Junior et al, 2007).

[11] GMC Calculations from USDA-FAS PS&D, op. cit.

[12] World Bank, 2011.

[13] Natural Resources Canada, 2011.

[14] The Economist, February, 2011.

[15] Global Harvest Initiative, 2010.

[16] Thompson, op. cit.

[17] Cocks, 1998.

[18] Khanif, 2010.

[19] International Water Management Institute, 2009.

[20] International Water Management Institute, 1998.

[21] Ibid.

[22] Natural Resources Canada, op. cit.

[23] Schwab, 2010.

[24] Pulses are legumes, including various beans, peas, and lentils, that are used for animal feed.

[25] Canada is renowned for the genetic improvements made in rapeseed by reducing the amount of erucic acid, which made it unpalatable and somewhat toxic. Given the change in the product, the name was changed to canola. This transformation made canola one of the highest quality edible oils available.

[26] Before 1995, Canada subsidized grain transportation under the Crow's Nest Pass Agreement and the Freight Assistance program. These were removed in accordance with Canada's WTO obligations and as part of a government cost-saving program.

[27] Martin and Kruja.

[28] These prices are expressed in US dollars per hundred pounds of live hog.

[29] Korea suffered an outbreak of foot and mouth disease in hogs, Japan's industry was affected by the tsunami, and China is suffering from a drought which is affecting its grain crop.

[30] Many Canadian beef animals and most cull dairy cows were shipped to the United States for slaughter prior to the BSE outbreak. Export restrictions meant all of those cattle stayed in Canada. There simply was not enough slaughter capacity available. This requirement is presently being changed, which simply underlines how slow the system is to adopt new technology.

[31] Martin and Kruja, and many others.

[32] Stiefelmeyer, K. (2005) A Comparative Analysis of Productivity and Competitiveness in Agri-food Processing in Canada and the United States: An Update. *A George Morris Centre publication*. <http://www.georgemorris.org/GMC/publications/competitiveness.aspx?lID=205>

[33] The most comprehensive data sets in Canada and the United States are the Annual Survey of Manufacturers (and Logging in Canada) conducted annually by Statistics Canada and the US Census Bureau. For the most part these surveys are consistent and comparable and based on establishment/plant data. However there are slight differences in the data and some caveats should be acknowledged and observed in interpretation:

- The US Census Bureau conducts a census every five years – for the intervening years it generates annual survey data that is less comprehensive. Baldwin et al. 2002 suggest that in these years some smaller firms and new firms can be left out of the survey. Conversely, the Canadian ASM is a survey each year.
- Value added measures between Canada and the United States differ slightly: Baldwin et al (2002) also note that between years there are differences in the definition of value added between the countries.
    - Prior to 2000 data for head offices were included in the Canadian data – they no longer are. Head office data is not included in the United States.
    - In 2004 the Annual Survey of Manufacturers and Logging replaced the Annual Survey of Manufacturers in Canada, this included some conceptual and methodological changes. Commodity data from 2004 onwards cannot be readily compared with data published for previous periods.

However, in our analysis shown in Figures 30 and 31 these changes in methodology have had limited effects on the trends. The point to make is that exogenous factors such as currency appreciation or depreciation have not shown up in the trends like one would expect.

[34] Unfortunately, as has been pointed out in many publications, including *Why Mexicans Don't Drink Molson's* by Andrea Mandel-Campbell, the tendency is to hide behind the problems instead of seeing them as opportunities to be exploited.

[35] Brethour, C. et al. 2004. The Competiveness Impacts of Canada's Agricultural Product Review Regulations. Research conducted by the George Morris Centre. Prepared for the Canadian Animal Health Institute. Brethour, C. et al. 2005. Possible Incremental Measures to Address Horticulture Sector Concerns With Pesticide Regulation in Canada. Research conducted by the George Morris Centre. For Agriculture and Agri-Food Canada; CANTOX. 2007. International Comparison on the Management of Health Claims and Novel Foods. CANTOX Health Science International.;

Stiefelmeyer et al. 2008. Food Regulatory Systems: Canada's Performance in the Global Marketplace: A Case Study Approach. Research conducted by the George Morris Centre. Prepared for Food and Consumer Products of Canada.

[36] Conference Board of Canada, 2010.

[37] Operating earnings are the net after paying direct costs of production like seed, fertilizer, feed, labour, etc., and before accounting for depreciation and interest.

[38] It should be noted that government payments include crop insurance claims. These are clearly different than income support payments: crop insurance is clearly insurance and, therefore, a risk management program. They are included because the data source does not make a distinction between the two.

[39] We acknowledge that, when disaggregated by type of farm, there is likely a higher correlation.

[40] The concept refers to elements of trade agreements that have less practical effect than is implied by the surface information. For example, assume a country can legally subsidize at a level of $20 billion but is actually subsidizing at $12 billion. If that country signs an agreement to drop their legal subsidies by 50 percent (i.e., to $10 billion), then there is $8 billion of "water" in the agreement: i.e., it appears to be a 50 percent reduction but is only a 17 percent reduction in reality.

[41] Nancy Morgan, FAO liaison to the World Bank, Personal Correspondence.

About the Authors

Kate Stiefelmeyer

Kate joined the George Morris Centre as a Research Assistant in June 2000 after completing her bachelor's degree in Economics at the University of Guelph and a development course in Cuba. Kate returned to the Centre as a Research Associate in 2003 after completing a Master of Applied Science in the Environmental Applied Science and Management at Ryerson University.

At the George Morris Centre, Kate works on issues regarding competitiveness, strategic management, and regulatory and environmental policy. Kate managed the George Morris Centre's Canadian Agri-Products Policy project, which involved a jurisdictional scan of the Canadian agri-products sector, a series of focus groups with industry stakeholders from across the country, and a number of speaking engagements to communicate the results. Other recent projects include an assessment of human resources challenges in the sector, a study on the economic impact of the Ontario Nutrient Management Act, and a study for the Canadian Canola Growers Association to assess the economic impact of Canadian bio-diesel production on Canadian grain, oilseed, and livestock producers.

Larry Martin

Larry Martin has 40 years' experience in the agriculture and food sector. He is a mentor, author and management practitioner. In his role with the George Morris Centre and in his private practice, he teaches and coaches managers of farms, agribusiness and food companies from both Canada and the United States. He also writes and consults widely on agri-food policy, commodity markets and strategy. He has worked with a wide array of companies and organizations in developing their strategic and operational plans. He writes a monthly column on commodity markets for Food in Canada magazine.

His work has garnered him the awards of Fellow of the Canadian Agricultural Economics Society, the Wilson Loree Award for Excellence in Farm Business Management, and the Ontario Agricultural College Alumni Award for Excellence in Research.

Larry holds Bachelors, Masters, and PhD degrees in agricultural economics. He was Professor and Chair in the Department of Agricultural Economics and Business at the University of Guelph. He was the founding Executive Director and subsequently CEO of the George Morris Centre, an independent think tank on agricultural issues and policies located in Guelph. He chaired a national task force on competitiveness in the agri-food sector for the federal Minister of Agriculture. He is responsible for the highly acclaimed management and industry training programs that are run by the George Morris Centre. He has a substantial body of refereed and non-refereed research on economic issues in the agri-food sector.

Larry is or has been a director of Ridley Canada, Lake Erie Farms, Taps Breweries Incorporated, Big Sky Farms, Coldspring Farms and a member of the advisory boards for the Agriculture and Biotechnology Division of the Saskatchewan Research Council and of Burnbrae Farms. He is also a number of the Institute of Corporate Directors.

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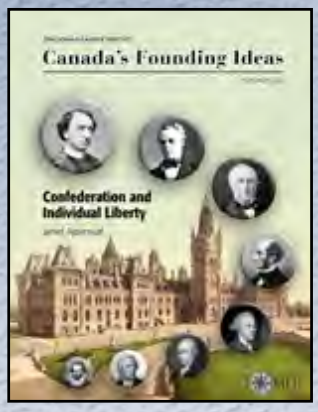

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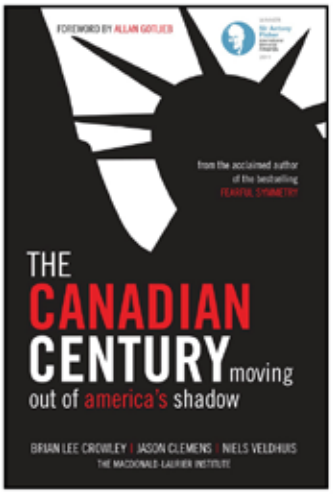

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