Effects of Agri-Food Exports on Farm Income

Economic & Policy Analysis Directorate
Policy Branch

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Preface

This report is part of the Trade Research Series that Agriculture and Agri-Food Canada (AAFC) is undertaking to support discussions in connection with multilateral and bilateral trade negotiations. The purpose of the series is to create an inventory of research that will make it easier for stakeholders to identify concerns, issues and opportunities associated with such discussions. The research is for the most part directed to areas in which little or no information has been circulated rather than to areas in which a broad base of literature already exists. More information on the Trade Research Series is available on the AAFC website at *www.agr.ca/policy/epad*, or by contacting Brian Paddock, Director of the Policy Analysis Division, Policy Branch (email: *Paddobr.em.agr.ca*, phone: (613) 759-7439).

During the last few years, there have been a number of agri-food industry groups which have either set export targets for themselves to achieve, or for the entire sector to achieve. As these challenges are put forth, the question arises as to what impacts their achievement would have on farm income. This report provides a quantitative study of the relationship between agri-food exports and farm income. Results from this report have been previously presented in a backgrounder for an August 1999 News Release concerning Canada's initial position for WTO agriculture negotiations, and in an article in the 1999 2nd Quarter issue of Quarterly Trade Highlights.

Executive Summary

The increase in the value of agri-food exports throughout the 1990s has largely been a result of value-added commodities. Though bulk exports have continued to grow at a slower rate, domestic sales to processors have increased due to increased foreign demand for further-processed products. The benefits of these sales extend both upstream and downstream from primary agriculture production. By increasing agri-food exports, the whole economic infrastructure surrounding agricultural activity, both on the farm, in the community and across the country, stands to benefit.

There are several sources of export growth: improved access to foreign markets, productivity growth, a decline in prices of Canadian products relative to those in the rest of the world, or a reallocation of resources between sectors in the economy. Each of these sources of export growth leads to different changes in output, input prices, and in the utilization of the factors of production. These changes will, in turn, lead to different outcomes in net cash farm income. This point is illustrated through two scenarios in this paper. In one scenario, import access is increased globally through a reduction in all agri-food tariffs for all countries. In the other scenario, demand is increased for Canadian exports through a decrease in the value of the Canadian dollar. Both scenarios generate a $1 billion increase in agri-food exports. The results indicate that, when all other factors remain constant, a $1 billion increase of agri-food exports benefits farmers as net cash farm income increases $250 million and $310 million, respectively[1]. This impact should not be taken as a prediction of the future but more as an indicator of the long run relationship between the two data series.

The fact that the increase in net cash farm income is less than 100% of the increased value of exports is no surprise given that net cash farm income incorporates production costs while the value of exports does not. Export value is defined in gross terms and represents revenue for foreign sales. Net cash farm income is the difference between cash receipts (including program payments) and cash expenses. While primary producers do not capture all the benefits, in the long run they do retain a portion of the returns to the Canadian economy. The remaining benefits of increased exports are passed on through indirect and induced effects to other segments of the agri-food sector, such as to the input, processing and manufacturing sectors, as well as the Canadian economy as a whole. Precisely how these benefits are distributed, however, varies according to the source of growth.

1. The analysis used a computable general equilibrium model.

Section 1: Introduction

On the eve of another round of World Trade Organization negotiations on the Agreement on Agriculture, trade liberalization and its benefits have become a growing area of interest for Canadian industry and government. This interest in the benefits of trade has been reinforced by agriculture's increasing reliance on the market and a growing need for additional markets to sell the sector's products. A number of Canadian industry groups not only have sought improved international market access for Canadian products, but also have issued a challenge to the agri-food sector to grow through the export market. For instance the Canadian Agri-food Marketing Council has adopted a goal that by 2005 Canada's agri-food exports should equal four percent of global agri-food exports. This goal has been endorsed by Agriculture and Agri-Food Canada.

Despite the broad based interest in exports, some groups have raised the concern that an insufficient share of the benefits from trade are ending up in producers' pockets. While there has been a significant amount of research on the benefits of trade liberalization to the Canadian agri-food sector, few of the studies have focussed on the effects of agri-food exports on net cash farm income.[2] The motivation for this paper is to remedy this situation and to examine the impact on producers' net cash farm income as a result of increased agri-food exports.

The primary objective of the paper is to develop a short hand relationship between the value of Canadian agri-food exports and Canadian farmers' net cash farm income where the latter is the difference between farm cash receipts (including program payments) and farm cash expenses. The second objective is to present the more general relationship between trade and farm income and the numerous factors that hinder a simple explanation of why net cash farm income does not follow export value. Section 2 demonstrates the sources of export growth and the importance of exports to revenue growth. Section 3 describes the modeling techniques and method of analysis employed in this paper. Section 4 presents the results and their implications. Section 5 discusses the impacts of increased trade on net cash farm income in more general terms and Section 6 provides conclusions.

2. An exception to this statement is Adelman and Robinson 1986.

Section 2: Importance of Exports and Sources of Growth

Between 1971 and 1997 the value of agri-food exports increased 900 percent in nominal terms. During the same time period, net cash farm income increased by only 200 percent. These two relationships are shown in Figure 1. While the growth in agri-food exports is impressive it is important to keep the relationship between the value of exports and net cash farm income in perspective. Export value is defined in gross terms and represents the receipts for foreign sales of both bulk agricultural products and processed food. Net cash farm income is a net concept which accounts for growth in both revenues and costs.[3]

The greatest improvements in the value of agri-food exports have occurred since 1989 (Figure 1). Since that time, the proportion of value-added commodities to total agri-food exports has increased from 42 percent to 60 percent. While in general, net cash farm income has also followed an upward trend since 1971, it has not been to the same magnitude as agri-food exports. There have also been intervals when increases in agri-food exports were not matched by increases in net cash farm income. However this was mostly due to government intervention rather than market forces. For instance, net cash farm income decreased sharply between 1989 and 1991 despite the continued growth of market crop and livestock receipts and processed food exports over the same interval. The decline in net cash farm income was due to a 44 percent drop in direct government payments including the 1988 termination of the Special Canadian Grains Program, the 95 percent decrease in the Canadian Crop Drought Assistance Program[4] and the 75 percent reduction in the Western Grain Stabilization Program, both in 1989[5]. Similarly, after 1974–1975 when Russian purchases of grain drove prices up sharply, the return of prices to more stable levels caused net cash farm income to

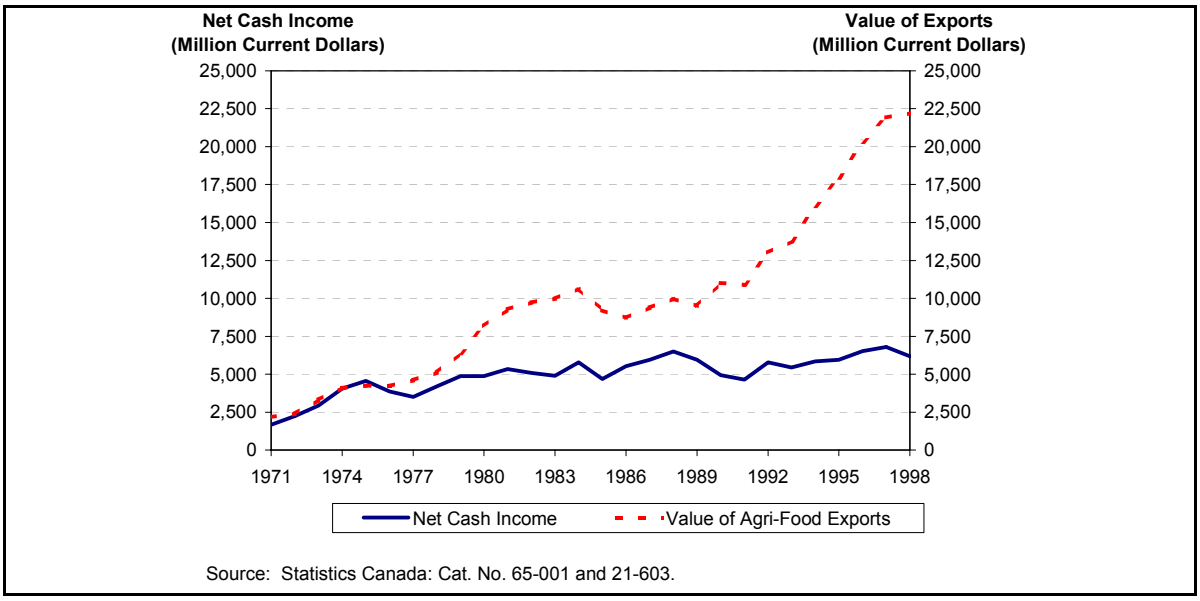
3. Another measure of farm income which incorporates depreciation charges is realized net income. Realized net income is the net cash farm income plus income-in-kind and less depreciation. Depreciation refers to the consumption of capital due to wear and tear. Realized net income is not shown in Figure 1 because it is a real term which nets out inflation while the growth in export value does not. The two trends in Figure 1 are both in nominal terms. However, references to realized net income will be included in this study since the effect of depreciation on realized net income can be significant.

4. While the Canadian Crop Drought Assistance Program lasted from 1989–1991, only the 1989 payment was significant ($736 million).

5. Statistics Canada: "Agriculture Economic Statistics." Cat. No. 21-603-UPE.

drop. Even realized net income was detrimentally affected as depreciation charges rose. This fall in both kinds of farm income occurred despite grain receipts 60 percent higher than in 1973.

Figure 1: Value of Canadian agri-food exports and net cash income (1971–1998)

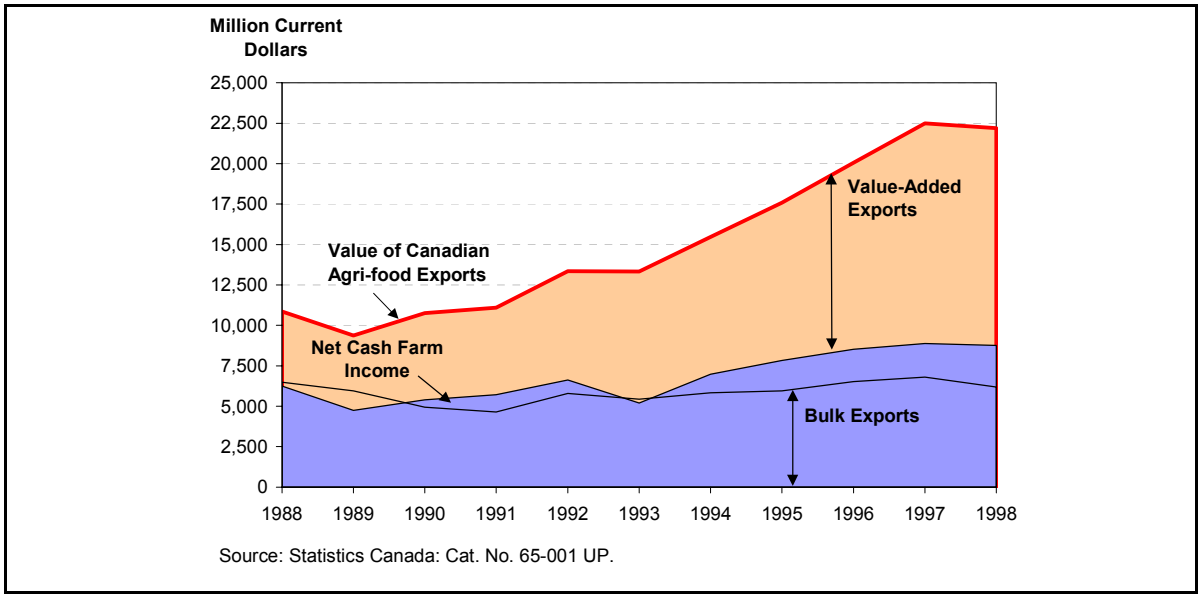


Between 1993 and 1998, the value of Canadian agri-food exports increased 50 percent (Figure 2). This change can be attributed to increases in the quantity exported (18 percent), increases in world market prices (27 percent) and the depreciation of the Canadian dollar against most currencies. After the period of rationalization and restructuring that occurred around the time of the implementation of the Canada–U.S. Free Trade Agreement, processed food exports and imports grew rapidly for both Canada and the United States.[6] As shown in Figure 2, the expansion of trade in processed food increased the total value of agri-food exports and lowered the proportion of bulk agricultural exports in the make-up of total agri-food exports. With processed food accounting for an ever increasing majority of the value of agri-food exports, one would also expect to see a weaker relationship between net cash farm income and the value of total agri-food exports.

During the same period, there were changes in farm structure and enterprise mix brought about by government program changes such as the loss of the Western Grains Transportation Act and the termination of the Gross Revenue Insurance Program. Declining real prices also precipitated the rationalization of farming operations. Producers became less reliant on grains and more reliant on specialty crops and intensive livestock farming. As the mix of farm types changed over time, so too did the composition of net cash farm income. For example, the decline of direct government payments resulted in their smaller and smaller share of net cash farm income. Consequently, many producers became more exposed to market forces, particularly those driven by world markets.

6. See Gehlhar and Vollrath 1997.

Figure 2: Composition of Canadian agri-food export value (1988–1998)



Hence, while Figure 1 cannot be used to predict the benefits of agri-food exports to farmers, it does effectively demonstrate the growing importance of external markets for the agri-food sector, the variability of net cash farm income and consequently, the complexity of determining any relationship between net cash farm income and exports.

Sources of income growth

In order for net cash farm income to grow either revenues must increase, or expenses must decline, or both. Productivity growth will contribute to both of these ends.

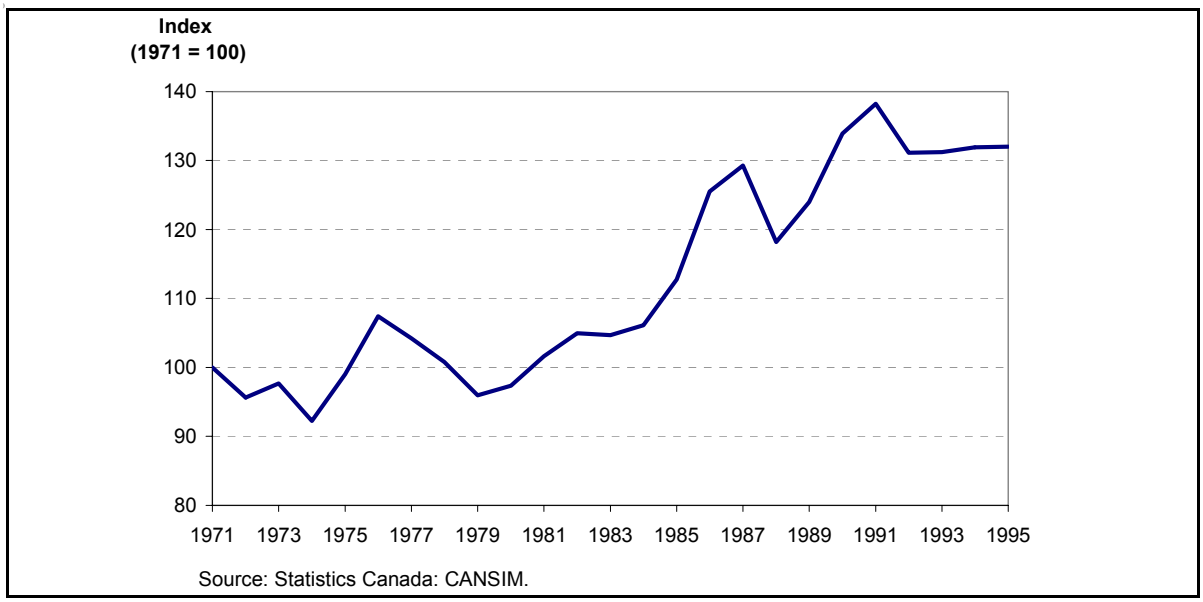
Figure 3 describes the productivity growth for primary agriculture between 1971 and 1995. During this period, multi-factor productivity increased 50%. Thus for the same amount of inputs, a farmer is able to produce one and a half times the amount of output. This growth in productivity raises two questions: where would Canada sell its agricultural output if not for international markets, and if Canadian producers were limited to domestic markets how much would prices have to decline to sell the extra output? As it is, Canada is highly dependent on export markets, as demonstrated in Table 1. Further growth in the agricultural sector would require new markets and these markets are only available through exports.

Sources of export growth

There are several possible sources of export growth. Exports of Canadian products can grow for demand side reasons, such as improved market access to foreign markets or a growth in foreign income. Exports can also grow for supply side reasons, such as productivity growth or a reallocation of resources between sectors in the economy. Each of these sources of export growth leads to different changes in output, input prices, and in the utilization of the factors of production. These changes, in turn, impact net farm income differently. Hence, no ***unique*** relationship between the growth in agri-food exports and the growth in net cash farm income can be determined.

Similarly, the distribution of benefits of increased agri-food exports among the different sectors of the economy will vary according to the source of that growth. Different sources of growth in agri-food exports will lead to different adjustments in the overall economy and will benefit more than just the agriculture sector.

Figure 3: Multi-factor productivity (1971–1995)



Note: Multifactor productivity (MFP) is based on a gross output measure. In this context, MFP is obtained as the difference in growth rates between real gross output minus the contribution of all primary and intermediate inputs in volume. The contribution is obtained by weighting the growth of each input by their respective share in value. The sum of the shares is assumed to be equal to 1.

Table 1: Export share of production for select agricultural commodities, Canada (1993–1997 average)

Commodities	Percentage
Beef Cattle*	48%
Hogs*	35%
Wheat	84%
Barley	26%
Canola	51%
Apples	16%
White potatoes	30%

*Live animals plus meat sales expressed in live animal equivalents.

Source: Statistics Canada.

Section 3: Modelling Techniques and Analysis Employed

As Canadian agri-food exports grow, all sectors of the Canadian agriculture industry stand to benefit. There are many different ways to measure this benefit. One method, value added, effectively represents the return to all farmer owned assets (i.e. land, labour and capital equipment). Value added is the return to the farmer after all intermediate purchases have been paid for. As such, value added can be thought of as net cash farm income to all farmer owned factors of production.

The impact on value added from increased agri-food exports will be reported in this paper. However, realized net income will also be reported since it is the more commonly used definition of farm income. Realized net income is equal to net cash farm income plus income-in-kind less depreciation. Depreciation[7] is a non-cash cost reflecting an allowance for the eventual replacement of worn out machinery and buildings. In 1995, the base year of this paper, depreciation amounted to 31 percent of net cash farm income.

A multiplier, or the change in a dependent variable for a given change in an independent variable, is a short hand method of describing the impact of a policy change. The purpose of this paper is to describe the impact on farmer welfare, value added, of an increase in exports. The change in the value of exports, in this case, is the independent variable whereas the impact on value added is the dependent variable. The value of exports is altered through two means: a change in global agri-food import tariffs, and a change in real exchange rates. These changes are not meant to suggest any actual new government initiative or policy. They are simply a means of changing the general equilibrium system in order to gauge possible impacts to value added. Furthermore, no changes to government program payments, beyond those existing in the 1995 base year, are considered in this analysis.

Strictly speaking, the relationship between value added and agri-food exports cannot be described by a single multiplier because the relationship between the value of exports and value added will differ depending on the applied policy change. However, multipliers can be calculated for a range of situations to give a sense of the relationship between the value of exports and value added. Thus, a multiplier representing the change in value added for a $1 billion increase in agri-food exports will be reported for several different scenarios. The

7. This definition is an economic one, not an accounting definition.

best method to derive these multipliers is a systematic approach that will account for all interactions in the economy. The approach chosen in this paper is that of general equilibrium. The advantage of a general equilibrium model is that all interactions in the economy are accounted for, including all price and quantity adjustments in all product and factor markets.

The model used for this analysis is the Global Trade Analysis Program (GTAP), a general equilibrium model which can simulate the effects of applied shocks to the agri-food sector (such as changes to export subsidies or tariff rates) in both factor and product markets of a global economic system.[8] The GTAP accounts for bilateral trade flows between every country. Thus the origin and destination of all goods to and from Canada are accounted for. For this analysis, countries are organized into seven main groups: Canada, United States of America, Australia and New Zealand, Japan, European Union (EU), Asia and the rest of the world. The agri-food sector is divided into nine sub-sectors: wheat, grains, oilseeds, cattle, hogs, processed meats, other primary agriculture, other processed agriculture and an aggregate of the other sectors (manufacturing, natural resources and services).

The analysis comprises three parts: the aggregate impact on value added in the primary agriculture sector from an additional $1 billion of agri-food exports (Part A); the impact on value added in the nine sub-sectors from an additional $1 billion of agri-food exports generated from reduction in agri-food tariffs (Part B), and the implications of these results (Part C). Part A includes four scenarios:

- Scenario 1 assumes a global expansion of import access through a reduction in all agri-food tariffs for all countries
- Scenario 2 increases demand for Canadian exports through an exchange rate induced decline in prices of Canadian products relative to those of other countries
- Scenario 3 lowers the EU's wheat export subsidy by US$50
- Scenario 4 is a combination of agri-food tariff reduction, the elimination of the EU wheat export subsidy and a reduction in domestic support.

In Part B, the impact of improved market access is isolated for each of the nine sub-sectors.

8. See Hertel and Tsigas 1997.

Section 4: Results

Part A: Aggregate impacts for the primary sector

Scenario 1:

A global improvement in market access is approximated by a four percent reduction in all agri-food tariffs (primary and processed products) for all countries. This policy change is sufficient to increase Canadian agri-food exports by $1 billion. The impact of the policy has only a minimal effect on the world prices of Canadian primary agricultural products which increase between 0.2 to 0.4 percent. Primary agricultural output, however, increases between 2.0 to 4.0 percent. Table 2 illustrates the impact on value added. Producer value added increases by $250 million and realized net income increases by $170 million. These figures represent the share of export revenues which returns to the primary sector. The remaining share of export revenues is dissipated throughout the rest of the economy.

Table 2: Impact on value added in the primary agriculture sector of a $1 billion increase in agri-food exports caused by a global reduction in tariffs

Sector	Effect on value added	Effect on realized net income
Primary agriculture	$250 million	$170 million

Scenario 2:

The demand for Canadian exports may also be increased through an exchange rate-induced decline in prices of Canadian products relative to those of other countries. A three percent depreciation of the real exchange rate is sufficient to increase agri-food exports by $1 billion.[9]

9. The GTAP does not explicitly account for exchange rates expressed as dollars of Canadian currency per unit of foreign currency. The impact of a devaluation can, however, be mimicked by shocking the trade balance such that the return to primary factors adjusts to promote exports and to choke imports. The resulting change in the relative price of primary factors across regions represents a change in "real exchange rates." The shock required for a three percent decline in real exchange rates is a $40 billion decline in Canada's trade balance.

With this scenario, the world price of Canada's exports of primary agricultural products declines an average of two percent. Despite this decrease, primary agricultural output actually increases between six and nine percent due to a relatively larger reduction in the cost of inputs. The overall impact is a $310 million gain in value added to primary producers, or a $210 million improvement in realized net farm income as illustrated in Table 3.

Table 3: Impact on value added in the primary agriculture sector of a$1 billion increase in agri-food exports caused by a three percent depreciation of the Canadian dollar

Sector	Effect on value added	Effect on realized net income
Primary agriculture	$310 million	$210 million

Scenario 3:

The third scenario examines the repercussions for Canada of a hypothetical reduction of European support for wheat exports. A US$50 decrease in the export subsidy to EU wheat exports increases the world price of Canadian wheat exports only half of a percent, but the volume of wheat exports grows eight percent. The world price of Canadian coarse grains and oilseeds improves very slightly (0.06 to 0.07 percent) accompanied by a slight decline in production (-0.12 to -0.14 percent) due to the transfer of land from the production of grains and oilseeds into wheat. Overall, total Canadian agri-food exports grow 240 million (not $1 billion as in previous scenarios) with the majority of this amount attributed directly to increased Canadian wheat exports.

Table 4 illustrates the effect on value added for an **equivalent** $1 billion increase[10] in agri-food exports. The impact on value added to Canadian primary producers in Scenario 3 is considerably higher than for the first two scenarios at $740 million, or a $510 million improvement in realized net farm income. This very high figure, relative to the first two scenarios, arises due to the significant impact on Canadian wheat producers as a result of the decrease in the European wheat subsidy. Unlike Scenarios 1 and 2 where the decrease of tariff rates and of the value of the Canadian dollar applied to all primary agricultural commodities, the impacts of this scenario are experienced primarily by the Canadian wheat sector. In fact, of the $740 million improvement in Canadian value added to primary producers, wheat producers would claim nearly $690 million or $480 million in realized net income. Coarse grain producers also benefit by $10 million due to small increases in the world price of Canadian coarse grains. The value of land used in the production of coarse grains also increases slightly due to the transfer of land into wheat production. These results are tabulated in Table 4. The remainder of the $1 billion improvement in agri-food exports would be spread to other sectors of the economy through intermediate input use such as seed, fertilizers and equipment.

10. While the effect on agri-food exports is only $240 million (and not $1 billion as in Scenarios 1 and 2), by converting to a base figure of $1 billion, the impacts between scenarios can be more easily compared.

Table 4: Impact on value added in the primary agriculture sector of a $1 billion increase in agri-food exports as a result of $50 U.S. reduction in the EU wheat export subsidies

Sector	Effect on value added	Effect on realized net income
Wheat	$690 million	$480 million
Other grains	$10 million	$10 million

Scenario 4:

The fourth scenario considers the combined effects of a one percent reduction in output subsidies in all countries, a global two percent reduction in agri-food tariffs and a US$50 decrease in the export subsidy to EU wheat exports.[11] The increase in Canadian agri-food exports is approximately $1 billion.

Due to the imposed decrease of both global import tariffs and output subsidies, the benefits to the Canadian agri-food industry are spread more evenly over each sector. The Canadian export price of all commodities declines, encouraging other countries to purchase Canadian products. However, the inclusion of the US$50 decrease in European wheat export subsidy does cause the impacts of this scenario to favour the Canadian wheat sector slightly more than other sectors, i.e. there is a greater improvement in the value of wheat exports than other primary agriculture products. The overall improvement of Canadian value added is $280 million, or a $200 million improvement in realized net farm income.

Table 5: Impact on value added in the primary agriculture sector of a $1 billion increase in agri-food exports caused by a two percent decrease in global agri-food tariffs, a one percent decline in output subsidies, and a US$50 reduction in EU wheat export subsidies

Sector	Effect on value added	Effect on realized net income
Primary agriculture	$280 million	$200 million

Part B: Detailed commodity effects

The impact of improved market access can be isolated for each of the nine sub-sectors. To this end, global tariffs are reduced one sub-sector at a time such that the value of Canadian agri-food exports is increased by $1 billion. In order to attain the desired $1 billion increase, the required tariff reduction is different for each sub-sector. The impact on Canadian value added is traced through each of the primary agricultural commodities. The processing sector is not considered since this paper concentrates on the benefit to farmers of increased Canadian agri-food exports.

11. Although this scenario could represent a package of trade reforms, it is not intended to represent any expected trade liberalization.

Table 6 details, for each reduction in global sector specific tariffs, the share of benefits flowing to each sub-sector. The global tariffs were removed individually for each commodity. The impact on value added in each sub-sector emanating from that tariff reduction is detailed across the row. For example, reading across the first row labeled "Wheat" demonstrates that a reduction in wheat tariffs, across all countries, will impact the value added of not only the wheat sector but also of the whole grains sector. Specifically, for every $1.00 increase in wheat exports brought about by a reduction in the wheat tariff, value added for wheat producers improves by $0.69. The benefit to the coarse grain sector is minute but positive, with value added to coarse grain producers improving by $0.01. This benefit occurs because the tariff reduction increases the world price of wheat which, in turn, strengthens the price of coarse grains. As a result, Canadian production of wheat and coarse grains both increase. The remaining benefits are passed to other sectors through intermediate input use.

Because the price of the major intermediate inputs (fertilizers and chemicals) used to produce cereals and oilseeds is not as sensitive to increases in the use of inputs to livestock production, the multipliers for grains and oilseeds tend to be higher than for red meats. The difference in multipliers, between grains and oilseeds, depends on differences in input use between the sectors.

The multipliers for cattle and hogs in the Canadian cattle and hog sectors ($0.52 and $0.36) are less than those for grains and oilseeds ($0.52 and $0.56) in their respective sectors. The reason is due to the fact that more of the benefit is passed to related sectors. For instance, as more animals are grown for export, more feed will be used, which in turn increases the domestic price of feed. Part of the increase in livestock export revenues is passed on to the grains sector through those higher domestic feed prices. Thus, in the case of cattle and hogs, $0.05 and $0.04 respectively of every $1 increase in agri-food exports is passed on to grain producers and $0.06 and $0.05 respectively is passed on to oilseed producers. The difference in the multiplier for cattle ($0.51) versus hogs ($0.36) can be explained by the capital investment (barns, farrowing equipment) required for hog production that is not required for cattle production. The hog sector passes a much larger share of the benefit of increased export on to the intermediate input sector than does the cattle sector resulting in a significantly smaller multiplier. Furthermore, as detailed in the row labeled "Cattle," when exports are increased in the cattle sector there is a minuscule shift away from hogs ($-0.01) as relative prices favour cattle production. That small decrease in value added to the hog sector affects the processed meat sector ($-0.01) as the total number of animals dips slightly.

Table 6: Impact on value added for a $1.00 increase in agri-food exports in the nine sub-sectors

	Effect on value added					
Sector	**Wheat**	**Coarse grains**	**Oilseeds**	**Cattle**	**Hogs**	**Processed meat**
Wheat	0.69	0.01	0	0	0	0
Coarse grains	0	0.52	0.01	0.01	0.01	0
Oilseeds	0	0.01	0.56	0	0	0
Cattle	0.01	0.05	0.06	0.51	-0.01	-0.01
Hogs	0.01	0.04	0.05	0	0.36	0.01
Processed meat	0	0.02	0.01	0.08	0.08	0.17

Similarly, reading across the bottom row, for every $1.00 increase in processed meat exports brought about by a decrease in global tariffs on processed meat, Canadian meat processors stand to gain $0.17. Additional processed meat exports requires increased livestock production which, in turn, increases feed requirements as mentioned above. Consequently, only part of the export revenues actually goes to processors. Both cattle and hog producers' value added improves by $0.08 for every additional dollar of processed meat exports, while coarse grain and oilseed producers benefit by $0.02 and $0.01 respectively. The remaining benefits are passed to other sectors through intermediate input use.

Part C: Implications of trade

Multi-factor productivity for the primary agriculture sector has increased nearly 50 percent since 1971. An important question to ask is what would have happened to net farm income if Canada did not have the export growth that it has experienced over the last two decades, if there were no markets for the additional production? While this question is purely speculative, a small modeling exercise can add information to this broader question. A scenario was implemented using the GTAP model, where multi-factor productivity for the primary sector was increased by 10 percent. The value of agri-food exports increased by eight percent as a result. The model was then adjusted to cut off that eight percent of additional agri-food exports in order to examine the effect on domestic prices. The result of closing foreign markets was an 11 percent reduction of value added for the Canadian primary agriculture sector than when the markets were open. Domestic producer prices were five–six percent lower with closed markets than when exports were allowed to flow freely. With prices falling this drastically with only eight percent of exports being halted, it is not hard to imagine the number of small farmers that would be driven out of business due to their inability to compete if agricultural exports were stopped completely. This situation would lead to an escalation in unemployment as displaced farmers enter the job market. Thus, this simple scenario provides an effective demonstration of the benefits of exports to producers' value added given an increasingly efficient agriculture sector.

A second factor to remember, in light of continuously improving productivity, is the slow rate of growth of domestic expenditures on food. Since 1988, Canadian expenditures on food and beverages in and away from the home have increased at an average annual rate of only 1.5 percent[12]. This rate is much slower than the eight percent average annual rate of growth of agri-food exports over the same time period. If no markets existed for additional agricultural production, it is unlikely that the Canadian population would be able to consume all that is produced regardless of the price decline.

The complex relationship between the value of exports and net cash farm income cannot easily be captured by simple multipliers. There are a number of factors that can create ups or downs in net cash farm income. The factors include (*inter alia*) an infusion of government transfers, a change in the timing of receipts and expenditures, bottlenecks in input markets which temporally escalate input prices, droughts and price wars.

To make short run predictions about any single agricultural variable is risky. To make short run predictions about a net variable, such as net cash farm income, is fraught with peril due to the number of random influences which can affect this variable. A number of short run shocks can temporarily send the two variables in different directions and the dynamics of the adjustment process can produce varying results over time. For instance high prices (perhaps as a result of a series of coincidental droughts across regions) in one year will induce a dramatic increase in world wide production the following year. The initial high product prices will also induce higher input prices (depending on agriculture's share of the input market). The increase in domestic production in the following year will depress prices. However, the production increase can offset the price decrease so that the value of exports actually increases temporarily. The effect on net cash farm income will incorporate both the lower commodity prices and the higher input prices. As a result, export values and net cash farm income may move in opposite directions over the short run. Over the longer run, production will adjust downwards and prices will strengthen.

The timing of expenses and receipts will also affect the relationship between the value of exports and net cash farm income. This effect will be amplified if the composition of exports are changing to higher valued products over time, such that the value of exports continues to increase while net cash farm income may temporally decline. The longer term effects, after all adjustments are realized, are described by the multipliers in Section 4, Part A.

12. Statistics Canada: CANSIM.

Section 5: Benefits of Trade

Recent history has shown that as agri-food exports increase, agri-food imports increase at about the same rate. From society's standpoint this is good news for the ultimate reason that exporting allows a nation to be better able to import, thereby increasing society's consumption possibilities. As the Canadian population grew, its composition changed with a different ethnic mix than ten years ago. As a populace, we are demanding more and more imported agricultural commodities. A third of agri-food imports comprises fruits, nuts and vegetables not widely produced domestically nor available year round. Another third is made up of products such as sugars, coffee, tea, spices and other products not typically available domestically. As a proportion of total domestic spending on food, however, imports still only make up less than 30 percent. Given that much of that 30 percent is spent on commodities not available in Canada year round, it cannot be claimed that these imports are entirely displacing domestically produced goods. On this basis, barring imports from entering Canada would not improve net cash farm income.

From a sectoral perspective more imports are also good news. Producers have access to cheaper, leading-edge inputs, enabling them to compete more effectively both domestically and abroad. Although imports may displace some domestic production, import competition may also motivate domestic producers to be more efficient.

Exposure to international trade is a powerful stimulus to efficiency. Efficiency, in turn, contributes to economic growth and rising incomes. Increasingly, imports are not always displacing domestic production, and indeed may complement it. More and more intra-industry trade (trade between similar countries in similar products) is taking place whereby goods cross the border in both directions. There are at least two reasons for the increased intra-industry trade. One involves the increasingly differentiated nature of agri-food products. Changing consumer tastes have resulted in a greater demand for product variety. This product variety is partially satisfied by domestic products and partially satisfied by differentiated imports. The other reason involves the disjointed production process of goods into many geographically separated steps. This phenomenon is known as "slicing up the value chain" (Krugman 1995). Agri-food products are flowing over the border at different stages of the production process. What may be exported as a raw product, may be imported as a semi-processed product and in turn re-exported as a processed product. As the composition of agri-food trade shifts to more and more processed products, final products become more differentiated and trade at different stages of the production chain also

increases. Thus, given the increased prevalence of intra-industry trade, farmers' net cash farm income should improve as a result of both increased foreign sales and the changing tastes of consumers for differentiated products which are increasingly satiated by domestically produced agricultural goods.

Producers of bulk commodities typically face significant differences in demand responsiveness between domestic and export markets. Demand for bulk products in domestic markets, in developed countries, is typically inelastic (not responsive to price changes). As domestic production increases, domestic prices must decline in order for all of the product to be sold. In this type of market, revenues will decline as domestic sales increase. Demand for bulk products in international export markets is typically price elastic. Large quantities of the product can be sold without depressing prices and increased exports will lead to increased market revenues. Therefore, producers of bulk commodities in growing sectors should look to export markets to increase their revenues. Limiting sales to the domestic market will either result in lower revenues or require production controls.

Section 6: Conclusions

The results of the four scenarios, while not necessarily indicative of any expected policy change, do indicate that for a variety of policy changes which increase the value of Canadian agri-food exports, farmers benefit in the form of increased Canadian net cash farm income as do other segments of the Canadian economy. In particular, the analysis shows that between $250 million and $310 million of a $1 billion increase in the value of Canadian agri-food exports is passed on to Canadian farmers in the form of net cash farm income. Due to the numerous factors which may impinge upon the variability between net cash farm income and the value of agri-food exports, these figures should not be taken as a prediction of the future but more as an indicator of the long run relationship between the two data series.

The fact that the multiplier is less than 100 percent of the increased value of exports is no surprise given that net cash farm income incorporates production costs while the value of exports does not. While primary producers may not capture all of the benefits, in the long run they do gain a portion of the returns to the Canadian economy. The remaining benefits of increased exports dissipate via indirect and induced effects throughout the agri-food sector. Precisely how these benefits are distributed, however, varies according to the source of growth.

For example, increased foreign demand for Canadian livestock promotes growth in this sector. As farmers' output increases, so does the need for inputs such as capital equipment, feed and veterinary services, fertilizers and pesticides. Some of the benefits are also passed on to other agricultural producers, such as grain growers, through increased sales to livestock producers. Downstream sectors such as transportation, processing and manufacturing are also positively affected as requirements for their services grow. Furthermore, part of the labour income generated by the improvement in the expansion of the agriculture sector, including the labour income generated in the input sector, the processing sector and at the farm level, is spent within the rural community. This transfer, in turn, enhances the viability of rural communities.

As Canada is highly dependent on export markets for agri-food sales, further growth in agri-food output requires new or expanded trading opportunities. These new markets increase the proportion of net cash farm income attributed to exports. The increase in the value of agri-food exports throughout the 1990s, however, was not solely the result of increased bulk exports but of value-added commodities. While bulk exports continued to grow at a slower rate than value-added goods, domestic sales to processors increased due to increased foreign demand. The benefits of these sales extend both upstream and downstream from primary agriculture production. Thus, by increasing agri-food exports, the whole economic infrastructure surrounding agricultural activity stands to benefit, both on the farm, in the community and across the country.

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