Proceedings of the Fourth Agricultural and Food Policy Systems Information Workshop

Economic Harmonization in the Canadian/U.S./Mexican Grain-Livestock Subsector

Edited by

R.M.A. Loyns
Ronald D. Knutson
Karl Meilke

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UNIVERSITY of GUELPH

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EXECUTIVE SUMMARY

ECONOMIC HARMONIZATION IN THE CANADIAN/U.S./MEXICAN GRAIN-LIVESTOCK SUBSECTOR

This is the fourth publication from a series of workshops which bring together agricultural economists, government officials and business people from the United States, Canada and Mexico for the purpose of enhancing communication on policy and trade issues. The objective of the workshop series is to develop and communicate objective economic information on trade and policy issues as a means to heading off wasteful tension and disputes among the three partners in the NAFTA agreement. The first two workshops focused on grain (1995) and dairy disputes (1996). The third workshop (1997) looked at disputes from the "other side" i.e., policy harmonization. The 1998 workshop and publication take the harmonization theme to the next level and examine the status of policy and trade harmonization issues in grain and livestock among Mexico, Canada and the United States.

This book focuses on trade issues and competitiveness within the grain-livestock subsector in North America. This topic is timely because:

- The grain-livestock subsector, by its size and position, is the foundation of agriculture and the food industry in Canada, Mexico and the United States.
- Major structural changes are occurring within this subsector. The origins of structural changes are primarily technological and product uniformity-driven, but the impacts on trade are and will be substantial.

- Structural change and the policies embodied in NAFTA and WTO hold the potential for increasing trade tensions among the three North American partners to NAFTA. Trade tensions are already apparent in the beef, pork and grain sectors.

The workshop was designed to provide analysis of four major issues:

- What is meant by "competitiveness" as applied to the grain-livestock subsector? The term is used in economic, trade, business and policy discussions, but it is elusive in terms of both meaning and measurement.
- Can we compare competitiveness of the grain-livestock subsectors in Mexico, Canada and the United States; if we do, what are the results?
- What are the factors influencing competitiveness; how are these likely to influence geographic shifts in production and trade?
- How are these, and other factors, likely to influence policy and trade tensions among the three partners to NAFTA?

The workshop was held April 21-22, 1998 in Lake Louise, Alberta, Canada. It was attended by policy economists from universities and governments, and business/interest group representatives from each of the three signatories to the NAFTA.

CONTENTS OF THE PUBLICATION

The book contains eleven papers in four thematic sections, with discussion comments. The papers were all prepared for this workshop by economists working directly on the target subject matter from among universities, governments and research organizations. Most discussants are from business settings including banks, grain and livestock processors, marketing agencies and interest groups. There is a significant component of the publication, three papers and two sets of discussion comments, provided by our Mexican contributors. Readers with an interest in the grain, livestock and small farm sectors in Mexico will find this material particularly useful.

The lead paper which addresses the basic issues of economic meaning and significance of "competitiveness" in trade agreements was prepared by Tom Sporleder and Larry Martin. The paper adopts the 1991 Office of Technology Assessment (OTA) definition of competitiveness... "the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expanding the real incomes of its citizens". The paper includes a thorough review of the evolution of recent trade agreements along with analysis of their impacts. The section on evolution and impacts on the agri-food industry is reinforced with three examples of induced technological and structural adjustment in Canada. The authors argue that harmonization and competitiveness in the next WTO round of multilateral trade negotiations will focus on genetically modified organisms (GMO's), state trading enterprises (STE's), and market access in agricultural and food markets. Murray Fulton's review comments extended the paper into the areas of innovation / intellectual property rights, and the role of competition policy in a world where competitiveness is a concern.

The second section contains four papers on developments in the grain and the livestock industries in each of Canada and the United States, two counterpart papers on the commercial grain and livestock industries in Mexico, and a paper on non-commercial small farms in Mexico. These papers are an exceptionally strong compendium of statistics, policy summary, evolution and structural change in the grain and livestock components of Canadian, U.S. and Mexican agriculture. The papers include analysis by Linda Young and Gary Adams; Kurt Klein and Gary Storey; David Anderson, James Mintert, and Gary Brester; Jill Hobbs and Bill Kerr; Beatriz Avalos-Sartorio; Roberto Aceves Ávila and Enrique López López; and Antonio Yunez-Naude. This section also includes discussant comments from seven industry representatives from all three countries. This section is an up-to-date, well-presented and well-documented analysis of the grain / livestock subsector in North America.

The third section presents a paper on issues in truck and rail transportation within NAFTA. Certainly freer trade within a geographically dispersed region like North America brings out the strengths and weaknesses of transportation capability. Barry Prentice and Bill Wilson provide a comprehensive review of structural and regulatory impediments to the smooth flow of products within the NAFTA region. In

particular, they illustrate areas where evolution of transportation regulation has not kept pace with other deregulation, suggesting that transportation remains a weak link in the North American marketing chain.

Section four reviews institutional forces affecting trade and policy tensions. Don McClatchy and David Schweikhardt ask the question…is policy harmonization necessary or desirable to structural adjustment under trade liberalization? Their answer is that it is both, and proceed to discuss institutional and regulatory considerations that would encourage achievement of that objective. The paper by Dave Ervin and Glenn Fox deals with the literature and issues surrounding trade liberalization and the environment. They challenge some of the conventional wisdom regarding greater environmental damage and increased consumer risks from increased trade… "there is reason to believe that an environmental dividend is at least possible from the pursuit of trade liberalization in agriculture...the realization of that dividend is contingent on an appropriate integration of trade and agricultural policies, and environmental policies and institutions".

The final section summarizes panel member comments made in relation to "what have we learned" in terms of implications, research needs and future directions. Panel members included Terry Francl, American Farm Bureau Federation; Shelley Thompson, Saskatchewan Wheat Pool; Roberto Áceves Avila, SAGAR; Ken Ash, Agriculture and Agri-Food Canada; and Chuck Lambert, National Cattlemen's Beef Association.

The coordinators for this workshop included:

— *Ron Knutson*, Food and Agricultural Policy Center, Texas A&M University

— *Karl Meilke*, University of Guelph

— *Fred Woods*, CSREES / USDA, Washington D.C.

— *Jack Gellner*, Agriculture and Agri-Food Canada, Ottawa

— *Al Loyns*, Prairie Horizons Ltd., Winnipeg

ORDERING THE PUBLICATION

This book is available at the nominal cost of $15.00 (which includes shipping and handling) in Canada and the United States. Prices on multiple copy orders, and in Mexico, are negotiable.

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FOREWORD

Economists usually herald the signing and existence of agreements which liberalize trading conditions among nations. Economic theory predicts increased collective benefits from production and distribution of goods and services when trade barriers are reduced. Resource allocation determined by competitive forces, resource endowments, comparative advantage and trade instead of "economically artificial" borders or rules improves economic performance. Certainly most agricultural economists supported the trade liberalization accomplished between Canada and the United States in the CUSTA, and later extended to Mexico in the NAFTA. These trade agreements are in their first full decade of operation and, along with the international counterpart (the Uruguay Round of GATT), many of the positive effects of these agreements are now apparent and accepted.

Trade, including agricultural and food trade, are increasing among the three partners to the NAFTA. Production and distribution patterns are shifting in relation to economic criteria. Investment and business linkages (some call them "vertical supply chains") are extending across borders and across sectors at unprecedented rates. All of these economic impacts are related to trade liberalization initiatives begun a decade ago among the three signatories to the NAFTA.

However, there is another side to trade and policy relationships in agriculture and food among the United States, Mexico and Canada. This past decade has also been highlighted by intense bickering, tension and outright disputes in a number of commodity / product areas. Trade agreements automatically generate some trade tension because new policies and rules will be tested. Trade policy and trade disputes

have been among the signatories to the NAFTA and some of those do not seem close to resolution...Canadian wheat, barley, cattle and hogs into the United States; tomatoes and Mexican trucks into the United States; some U.S. grain, poultry and dairy products not allowed into Canada; U.S. beef disrupting Mexican cattle markets; and Canadian malting barley exports limited into Mexico. The list goes on. Each point of stress or dispute costs scarce political, bureaucratic, interest group, and economic resources.

Economists may appear to have little to contribute to the resolution of these problems. Since trade liberalization is supposed to improve resource allocation and we have trade agreements which say they liberalize trading relations, then economists have made their contribution and the problems must be political or administrative. Our job is done.

It may be true, as many seem to believe, that economists have little to contribute to much of the political debate that conditions behavior of decision makers. It may also be true, as the cliche goes, that all economists laid end to end could not reach a conclusion, but that (laying all economists end to end) might be a good thing! Whatever the truth on these matters, a small group of U.S. and Canadian policy-oriented agricultural economists decided in 1995 that they, indeed, had a role to play in the disputes and stress that were accompanying the introduction of North American free trade. That role was seen to be the *creation and distribution of timely, relevant and objective economic information on the sectors that seem to generate most of the conflict*. Our objective is not to solve matters directly; that is well beyond the capability of any particular group. Rather *the objective is to influence decision makers, and possibly the individuals involved in conflict, by providing an economic information base related to conflict situations.*

In search of this goal, we established a series of workshops for the generation of policy and trade related material, and a commitment to quick and broad dissemination of the results through books like this one. Four workshops have been held and each of the publications has been released within nine months of the workshop. In 1997, we extended our organization and coverage to include Mexico. Originally we were only a group of economists. We have extended that to include business and interest group participation. Originally we targeted only twenty-five participants; the next workshop in Mexico in March 1999 will have sixty participants. We have established a solid network among several agricultural economists in

academia, government, and business in each of our three countries which is influencing projects well beyond this one. Importantly, business connections are beginning to be formed as a consequence of these associations. Have we contributed to reducing policy and trade tensions within the agricultural and food industry? Perhaps, but it remains an elusive goal.

Copies of this publication are distributed at a nominal charge. We encourage readers to use and quote the material. We would like to hear back from you on whether and how these papers are useful.

For information on other workshops, see *The Farm Foundation* website at *www.farmfoundation.org*.

R.M.A.Loyns, Prairie Horizons Ltd.
Ronald D. Knutson, Texas A&M
Karl Meilke, University of Guelph
Jack Gellner, Agriculture and Agri-Food Canada
Fred Woods, CSREES, USDA, Washington

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Conducting the workshops and publishing the results takes a great deal of effort, cooperation, and contributed funds. The Coordinating Committee extends thanks to those who participate, write and discuss papers, and revise them under unrealistic time constraints, and to the group of agencies and organizations that provide the financing for this project. David Ernstes at Texas A & M produced the summary of the discussion from Lake Louise. The job of editing and producing this book according to relatively tight time lines was accomplished this year by Donna Moore Walton and Lucie Beaulne of Agriculture and Agri-Food Canada in Ottawa, and Lenore Loyns in Winnipeg. Without all of you giving substantially more than you get, this project would not function. Funding from the following contributors is another essential piece of the project:

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Washington, D.C.

Agriculture and Agri-Food Canada
Ottawa, Ontario

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Ron Knutson is the Director, Agricultural and Food Policy Center at Texas A&M University. He holds many extension, teaching and research capacities in the policy arena. He is also a member of the Board of Trustees of the Farm Foundation and a member of the workshop Coordinating Committee. In 1997, he was awarded the AAEA Policy Excellence Award.

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Al Loyns is an original member of the Workshop Coordinating Committee. He was Professor, Agricultural Economics at the University of Manitoba and is now President, Prairie Horizons Ltd., a consulting company located in Winnipeg.

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Gary Storey is Professor of Agricultural Economics at the University of Saskatchewan. His areas of specialization include marketing, trade and policy.

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INTRODUCTION AND OBJECTIVES OF WORKSHOP

Ronald D. Knutson and R.M.A. Loyns

This is the fourth publication from a series of workshops which bring together agricultural economists, government officials and business people from the United States, Canada and Mexico for the purpose of enhancing communication on policy and trade issues. These workshops are designed to get participants and readers "on the same page" regarding forces and factors that give rise to policy and trade disputes. Our objective is to develop and communicate objective economic information on trade and policy issues as a means to heading off wasteful tension among our three countries. It would be unrealistic to expect economists to agree on every issue involving public policy, but at least it should be possible for the participants to understand why there are disagreements. The September 1998 actions against Canadian trucks carrying farm commodities by several border States once again indicates that much remains to be done to alter perceptions, behavior, and even conditions of agricultural policy and trade.

The first two workshops focused on grain (1995) and dairy disputes (1996). The third workshop (1997) looked at disputes from the "other side" i.e., policy harmonization in a reasonably broad sense. This workshop and publication take the harmonization theme to the next level and examine the status of policy and trade harmonization issues in grain and livestock among Mexico, Canada and the United States.

The process of producing economic information has been to assemble a small group of economists from universities, from governments, and from business to prepare original papers on topics identified by the coordinating committee. It has been our approach to have considerable free and open discussion, and to publish the proceedings within a few months of the workshop. Beginning with the dairy program in 1996 we brought in business people, and we have increased that component each year since. The participants from business and the commercial agencies have added an extremely valuable dimension to our efforts. Similarly, in recognition of the trinational characteristics of North American trade, what began as a Canada/

United States focus in 1995 was expanded to include Mexico in 1997. Each of these changes in the program has been valuable in terms of the relevance of our work and a contribution to networking across our agricultural and food industries. Funding for the workshops comes from a variety of private and public sources. Authors of papers, discussants and workshop participants are important extra-financial contributors.

This workshop focuses on trade issues and competitiveness within the grain-livestock subsector in North America. This topic and the particular subsector were chosen for three reasons:

- The grain-livestock subsector, by its size and position, is the foundation of agriculture and the food industry in Canada, Mexico and the United States.
- Major structural changes are occurring within this subsector. The origins of structural changes are primarily technological and product uniformity-driven, but the impacts on trade are and will be substantial.
- Structural change and the policies embodied in NAFTA and WTO hold the potential for increasing trade tensions among the three North American partners to NAFTA. Tensions are already apparent in beef, pork and grains.

The workshop was designed to provide analysis of four major issues:

- What is meant by "competitiveness" as applied to the grain-livestock subsector? The term is used in economic, trade, business and policy discussions, but it is elusive in terms of both meaning and measurement.
- Can we compare competitiveness of the grain-livestock subsectors in Mexico, Canada and the United States; if we do, what are the results?
- What are the factors influencing competitiveness, how are those likely to influence geographic shifts in production and trade?
- How are these, and other factors, likely to influence policy and trade tensions among the three partners to NAFTA?

The workshop which produced the papers presented in this book was held in April 1998 at Lake Louise in Alberta, Canada.

This book is presented in the same format and sequence that the papers were presented at the workshop. The first section "*Economic Perspective on Competitiveness*" is a background treatment of the meaning and significance of the term "competitiveness", and its importance to the world of trade agreements. The second section contains four papers on developments in the grain and the livestock industries in each of Canada and the United States, two counterpart papers on the commercial grain and livestock industries in Mexico, and a paper on non-commercial small farms in Mexico. The third section presents a paper on issues in truck and rail

transportation within NAFTA. Section four reviews some institutional forces affecting trade and policy tensions. The final section summarizes comments made by selected participants in the context of "what have we learned" in terms of implications, research needs and future directions. One conclusion drawn from this workshop was that private sector adjustment to trade liberalization may be a source of policy and trade tension. The topic "*Policy Harmonization in the North American Agricultural and Food Industry: Private Sector Adjustment*" has been chosen for the next workshop to be held in Mexico in March 1999.

These workshops would not be possible without direct financial support. Three organizations have consistently provided support for these workshops including Agriculture and Agri-Food Canada, the U.S. Department of Agriculture, and the Farm Foundation. Agencies of the USDA that have provided support for this workshop include the Cooperative State Research, Education and Extension Service (CSREES), the Foreign Agriculture Service (FAS) and the Agriculture Marketing Service (AMS). Over time, private sector support from Canada has increased including, for this workshop, the Royal Bank of Canada, Cargill Limited and the Saskatchewan Wheat Pool. The organizers of these workshops are grateful for the support which allows this program to operate and provides for publication and distribution of the results in the form of this book.

Section 1

Economic Perspective on Competitiveness

The objective of this section is to identify the economic meaning and significance of "competitiveness" in a world where trade agreements create more open trading conditions.

ECONOMIC PERSPECTIVE ON COMPETITIVENESS UNDER WTO, NAFTA AND FTAA

Thomas L. Sporleder and Larry J. Martin

INTRODUCTION AND PURPOSE

Agricultural policy has been especially dynamic in most developed countries for the past several years. The rapid changes in policy within and among countries leads to uncertainty among decision-makers and encourages structural adjustment in response to the policy changes. The evolving policies also may have direct implications for the competitiveness and sustainability of certain types of agricultural production within specific countries. This climate of lessened restraints on trade provides an impetus toward globalization of the food system as never before.

In May 1998 officials from countries around the globe travelled to Geneva to celebrate the fiftieth anniversary of the founding of the world trading body known until recently as the General Agreement of Tariffs and Trade (GATT), now called the World Trade Organization (WTO). It is appropriate therefore that this manuscript broadly focus on the substantive economic changes that the Canadian-United States Trade Agreement (CUSTA), GATT/WTO, and the North American Free Trade Agreement (NAFTA) have encouraged, especially within and among Canada, the United States, and Mexico. In addition, some potential implications from the newer Free Trade of the Americas (FTAA) effort will be examined. These policies will be examined broadly regarding their influence on trade and competitiveness.

Trade in North America is considerable. United States total trade reached $1.98 trillion in 1997, up from $1.81 trillion in 1996. For 1997 exports were $933 billion, and imports were $1.05 trillion; both of these were all-time records. Major trading partners for the United States include Canada, Japan, Mexico, China, and Germany (U.S. Department of Commerce, 1996 and 1997). Canada was the largest supplier of U.S. imports, $168 billion for 1997, and exceeded Japan, which

imported $121 billion for 1997. Other large importers into the United States included Mexico at $86 billion and China at $63 billion, both in 1997 (U.S. Department of Commerce).

The leading markets for U.S. exports in 1997 were Canada at $151 billion, Japan at $66 billion, Mexico at $71 billion and the United Kingdom at $36 billion. The structure of this trade is worth noting. U.S. goods exports were comprised of 84 percent manufactured goods, 10 percent agricultural commodities, and 6 percent primarily crude materials and mineral fuels for 1996 (U.S. Department of Commerce, 1996 and 1997). It is apparent that trade provides an economic tie among Canada, the United States, and Mexico. This trade, in both agricultural and manufactured goods, is important to each country in terms of the standard-of-living and the jobs and related economic activity that it creates.

There are numerous meanings for the term "competitiveness." The former Office of Technology Assessment (1991) has defined competitiveness as "…the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expanding the real incomes of its citizens" (OTA, 1991). This definition will be adopted here and used as one of several criteria for judging the influence of the policies examined.

MOVEMENT TOWARD FREER TRADE IN THE WESTERN HEMISPHERE

Factors Influencing Trade

Some key economic factors have developed in the past decade which serve to influence both the amount and structure of trade within the food system. Among these factors are technological progress, globalization of the food trade, and rather rapid evolution of strategic partnering and vertical integration within certain commodity subsectors.

Technological progress, especially in information technology, is widely regarded as a leading factor promoting the unification of the world. Information technology is responsible for everything from instantaneous news from all parts of the world to detailed information on grocery store product movement in timely fashion through the use of universal product codes and front-end product scanning. Technological progress in packaging also has spawned an era of aseptic packaging and similar innovations that result in extended-life or "shelf-stable" products at ambient temperatures. This type of technological progress enhances geographic independence relative to location of processing because products can be shipped longer distances more efficiently than ever before.

It is apparent that there are economic incentives for transnational vertical integration by businesses which possess proprietary rights to commercial biotechnological products or processes. Rights to commercial biotechnology products or processes are held to be firm-specific intangible assets which may provide incentives

for foreign direct investment (FDI) by the firms holding such rights (Sporleder and Henderson, 1993). The transnational character of intellectual property as an intangible asset is important in enhancing globalization of the food system. All else equal, licensing and other vertical coordination arrangements such as contracting and joint ventures is encouraged when firms possess substantial intangible assets.

Globalization of the food trade has resulted from international diversification of food processors, and to a lesser extent food retailers, in developed countries. International and product diversification play key roles in the strategic behavior of large firms (Hitt, Hoskisson, and Kim, 1997). International diversification is defined as expansion into markets across regions or countries. Thus, a firm's international diversification is reflected by the number of different markets in which it operates. Food processors, in particular, have become increasingly multinational (Handy and Henderson, 1996). Multinational firms exploit opportunities to integrate across political boundaries by standardizing products and achieving economies of size through coordinating critical resource functions such as R&D (Kobrin, 1991).

Competition among rival firms within the same industry may provide an incentive for managers to consider entering into cooperative relationships with vertically-allied firms. The drive for coordinative and cooperative relationships among vertically-allied firms may be motivated partly by searching for exploitable first-mover advantages over rivals with regard to resource supplies or core competencies. A recently emerging form of corporate partnering is referred to as *strategic alliances* (Sporleder, 1994). Strategic partnering has evolved rapidly, partly as an effort by firms to effectively and efficiently gain multinational status. Motivation within marketing channels to vertically coordinate production stages include efficiency and provision of more homogeneous quality.

Policies and Trade Agreements

The advent of the North American Free Trade Agreement (NAFTA) fortified Western Hemisphere (WH) free trade by reducing or eliminating trade barriers. In December 1994, WH countries met in Miami to begin negotiations to establish a "Free Trade Area of the Americas" (FTAA) by the year 2005. These negotiations closely followed the passage of the North American Free Trade Agreement (NAFTA) and the ratification of the Uruguay Round under the General Agreement on Tariffs and Trade (GATT) by 125 member nations. While the GATT is a world agreement that reduces trade barriers, the NAFTA is a free trade agreement that seeks to remove barriers to trade among the United States, Mexico, and Canada over a 15-year time frame.

Thirty-two WH countries participated in the Summit of the Americas. A theme of the Summit was economic integration to provide more open markets and freer movement of investment capital across national boundaries within the WH. A WH Free Trade Agreement would expand the NAFTA to include countries in Latin America, the Caribbean, and South America. Several trading blocs have already emerged within the WH.

Agreements among WH countries already established include: the Latin American Integration Association (ALADI); Central American Common Market (Bolivia, Columbia, Ecuador, Peru, Venezuela); Caribbean Community and Common Market (CARICOM); Group of Three (Colombia, Mexico, Venezuela); and Southern Cone Common Market (MERCOSUR - Argentina, Brazil, Paraguay, and Uruguay). In mid-1995, Chile was negotiating for inclusion into NAFTA. However, incorporating established trading blocs into NAFTA is considered simpler than adding some 35 independent countries individually.

Potential Influence of Economic Integration

Some recent research on the economic implications of free trade agreements (FTAs) in the WH has been conducted that employs the economic modeling of market integration. Several studies have analyzed the economic and specific agricultural impacts of the NAFTA, typically with reference to a base case without the NAFTA and an alternative scenario which incorporates total trade liberalization. In a recent study, Tweeten lists the advantages and disadvantages of regionalism, defined as the "…formation of political groupings or 'blocs' of countries for the purpose of promoting intra-regional trade" (Tweeten, p. 810). The research provides an assessment of the impact on U.S. agriculture of a Western Hemisphere free trade agreement. Among the advantages of regionalism are the benefits from trade of specialization and economies of size.

Another study of the impact of the NAFTA assesses the FTA's effects on farm wages and employment and land markets in the United States (Claassen and Gardner, 1994). In reference to a study which surveyed the literature on the labor impacts of the NAFTA, the authors indicate that factor market linkages, especially labor flows, represent a more extensive economic linkage between the two economies than does trade in goods (Claassen and Gardner, p. 63).

The significance of comprehending the effects of FTA's on labor markets lies in the fact that changes in factor mobility, in terms of labor migration, have a greater effect on factor returns (wage rates) than do changes in commodity trade (Hinojosa-Ojeda and Robinson, 1992; Burfisher, Robinson, and Thierfelder, 1995). Most CGE studies assume that labor is fully mobile among countries being analyzed, however, Claassen and Gardner use a partial equilibrium approach and assume that labor is not necessarily mobile among sectors. As a result, they found that the degree of labor mobility affects wage rate adjustments differently in different sectors.

Medich and Sporleder (1996) conducted research to analyze the long-term economic consequences of market integration on agricultural trade and production in the Western Hemisphere. Economic market integration refers to trade liberalization through regional integration of countries into trading blocs, resulting in a homogenization of factor inputs available for production in the integrated geographic area.

Their research employs a computable general equilibrium (CGE) model to analyze the effects of market integration in the Western Hemisphere. CGE models provide an economy-wide framework for quantitative analysis of international trade

issues. Global Trade Analysis Project (GTAP), operationalized by Thomas Hertel and others at Purdue University, is used because it allows for simulations of trade liberalization scenarios and provides post-simulation information on the state of the economy after the specified shock has worked its way through the economy.

The modeling of the economic effects of FTAs can be classified into CGE models or partial equilibrium models (PEM). Only CGE models can determine changes in economy-wide resource allocation, such as wages, employment, and migration (Hueth, O'Mara and Just, 1994). Following Burfisher (p. 5), a CGE model is defined as a type of applied, economy-wide model that simulates the behavior of a market economy. Within the model, sectors are linked in terms of factors of production and their use as intermediate inputs in each others' final production. The CGE approach allows the analysis to be based on macroeconomic equilibrium for the economy, including the fiscal deficit, savings and investment, balance of trade, exchange rates, and international terms of trade. Data contain sectoral aggregations on intermediate and primary factor demand, trade and prices, and household and government revenue and expenditure.

Results of the GTAP analysis suggest that from a U.S. perspective, the sectors that will gain exports include beverages and tobacco while imports within this sector remain virtually unchanged. For processed foods, grain, and livestock sectors, the analysis suggests that imports to the United States will increase while exports decline. For Mexico, exports of grains and livestock increase dramatically while imports within these sectors remain stable. The processed foods sector within Mexico is stable with changes in imports and exports nearly balanced on a value basis.

The analysis also suggests a substantial return on capital invested in WH countries after economic integration occurs. Return on capital after integration is dramatically improved in each WH country. The United States, Latin America, and Mexico in particular experience inflows of capital as a result of economic integration. Each country enjoys about the same influx of investment capital while Argentina and Brazil lag significantly.

The influence of market integration runs counter to the popular notion that American jobs and the flow of capital would move south of the U.S. borders as a result of the NAFTA. Mexico and the rest of Latin America benefit from trade liberalization, but the United States also enjoys an increase in its rate of return on capital and a corresponding increase in its capital stock.

General Aggregate Influence of NAFTA

The influence of NAFTA on trade is debated widely. Opponents of NAFTA argue that expansion of freer trade to developing countries, such as Mexico, because the U.S. will lose jobs through imports from countries with wages only a fraction of the level in the U.S. Others argue that NAFTA is a boon and actually increases U.S. employment though increased trade and investment opportunities.

An important empirical issue is the changes in trade patterns caused by lessening trade barriers, which is the primary mechanism through which number of jobs and living standards are influenced. Now that NAFTA has been in effect for over three years, recent empirical evidence is available from a interesting analysis by Gould (1998). He uses a gravity model to analyze aggregate bilateral trade flows and to control for factors influencing trade among Canada, the United States, and Mexico (Bergstrand, 1985).

The gravity model describes trade flows between countries as a function of their incomes, populations, the physical distance between them, and trade barriers. Part of the intuitive appeal of the gravity model is that, all else equal, trade is likely to increase the closer countries are and the lower the trade barriers between them. Among its shortcomings is that it does not account for induced changes in sectoral capital investment as a result of policy shocks.

The analysis indicates that the rate of growth in U.S. exports to Mexico, for the three-year period 1994-96, exceeds the rate of growth without NAFTA. On average, U.S. export growth to Mexico is about 16 percent greater annually with NAFTA, or about $21.3 billion for the period. Likewise, the analysis indicates about a 16 percent influence on imports into the United States from Mexico as a result of NAFTA, or about $20.5 billion over the period of analysis. However, the increase estimated for imports is not statistically significant, while the increase in exports is statistically significant. Similar calculations for exports and imports between the United States and Canada indicate no statistically significant influence on aggregate trade flows with NAFTA compared to what would have been expected without NAFTA.

The Gould (1998) analysis indicates that after controlling for the effects of income, exchange rates, and prices on trade flows, NAFTA has a significant positive influence on trade flows between the United States and Mexico but not the United States and Canada. The conclusion relative to the United States and Canada is without trepidation since CUSTA was inked five years earlier and it would be surprising to conclude that NAFTA had a separate identifiable influence from CUSTA on aggregate trade.

EVOLUTION OF TRADE ISSUES SPECIFICALLY RELATED TO AGRI-FOOD INDUSTRIES

GATT/WTO and their regional counterparts have evolved, starting with the original GATT agreement in 1947. Fundamentally, the original GATT charter establishes the principles that free trade is preferred to restricted trade, that tariff barriers are preferable to non-tariff barriers, and that export subsidies are not legal. But through a series of exemptions, agriculture was not subject to these requirements. These included (but are not limited to): Article XI2c1, under which Canada imposed import quotas for its supply managed commodities; the U.S. waivers, under which it imposed quotas for dairy, sugar, peanuts and cotton; the European Union's (EU) variable import levy program; and a range of import licenses, used by Canada to restrict imports of wheat, oats and barley.

The Uruguay Round was significant because it brought an end to most of these exceptions. The essential elements of the changes that evolved from the Uruguay Road and in CUSTA and NAFTA are indicated below.

From the agri-food perspective, several issues specifically about agriculture are addressed in each of the agreements: market access; export subsidies; domestic subsidies; and technical regulation. General issues important to agriculture include: dispute settlement (countervail and anti-dumping); rules of origin; and intellectual property protection. As a backdrop to the analysis of recent bilateral trade, a brief description of how CUSTA, NAFTA and WTO evolved is provided.

Market Access

Prior rounds of GATT established Most Favored Nation (MFN) tariff levels for products whose markets were not protected by non-tariff barriers. In the agri-food sector, many of these were substantial, regularly into the 25–30 percent range for many processed food products. Under CUSTA, Canada and the United States pledged to reduce these to zero over a five or (usually) ten-year phase-in period.

The two countries could not agree on ways to remove quantitative restrictions on Waiver and XI2c1 commodities. Canada also agreed to remove import licenses for wheat, oats and barley for U.S. exporters when U.S. domestic subsidies to growers were equated with Canadian subsidies. This has now been accomplished.

In NAFTA, which was supposed to be completed after the Uruguay Round, these tariff reductions were extended to Mexico and vice versa. Mexico and the United States were also able to agree to a 15-year phase-in of access for Mexico to U.S. sugar, cotton and dairy markets and for the U.S. to Mexico's corn and bean markets. Canada gave no additional access for either country to its dairy and poultry markets and, in turn, got no additional access.

WTO made a substantial breakthrough by committing members to remove quantitative restrictions and replace them with tariff equivalents. These were in the 175 to 350 percent range for Canada's protected commodities, and 75 to 150 percent range for U.S. products. The exception is fluid milk, which remains protected by non-tariff barriers. In addition, minimum access was provided, through Tariff Rate Quotas (TRQs), equal to at least 3 percent of domestic production, increasing to 5 percent over a six-year phase-in period. In-quota imports face a MFN tariff rate (or CUSTA/NAFTA rate, whichever is lower). All agri-food tariffs are to be reduced for member nations by an average of 36 percent and a minimum of 15 percent.

Other than the special cases, this means that Canada, Mexico and the U.S. by mid-1998 have preferential (below MFN tariffs) access over other members of WTO to each others' markets.[1]

[1]Export subsidies are in Rude, von Massow and Martin (1992). Readers are referred to this for a more complete description of the GATT component.

Export Subsidies

In CUSTA the parties agreed not to use export subsides against each other and in third party markets, they agreed not to use them when the third party market was identified as one that the other normally services. They also agreed to work together in the multilateral negotiations to reduce export subsidies. NAFTA essentially parroted CUSTA on this issue. The WTO established quantitative limits for export subsidies. Parties agreed to reduce them by 36 percent in overall expenditure and at least 21 percent for any individual commodity from a base actual expenditure in 1986-89. There is a six-year phase-in period, and the parties could begin from the higher of their actual expenditure in 1992 or the base period. The latter was added to accommodate the United States and EU, whose Export Enhancement Program (EEP) and export restitution programs had substantially higher expenditures in 1992 than in the base period.

The program of substance that this affected in Canada was the Western Grain Transportation Act, which removed all transportation subsidies in August 1995. Mexico, in particular, has made very substantial changes in its border policies, partly due to its commitments under NAFTA and WTO. Also, in part, Mexico changed due to domestic, unilateral reform through lower tariffs, removal of import licenses, and dismantling most of its state trading organizations.

Domestic Subsidies

Domestic subsidies are an issue because of the possibility that they confer an unfair advantage in international trade by providing government support for production. The factor that distinguishes them from export subsidies is that the latter are tied to exports instead of production. In this regard, they are also related to the issue of dispute settlement because they are the basis for countervailing duty cases.

In CUSTA, there are words to the effect that the parties desired to reduce subsidies. However, they agreed to reduce subsidies by working together, in the multilateral negotiations, toward reducing them in all countries. NAFTA contains essentially this same language.

Substantially greater progress was made in the WTO, which made a distinction between domestic policy instruments regarded as *green* and those regarded as *amber*. Green instruments are those that governments can use without limit. In general, they include infrastructural investment and income support programs that are generally available, and that trigger support at low levels of market results. Amber programs are those that trigger direct price or income support for individual or small groups of commodities. While they were not made illegal under the WTO (they are amber, not red), parties agreed to reduce them by 25 percent from a late 1980s base period and they remain subject to countervail actions.

This component, along with fiscal policy considerations, has made a very substantial difference to Canadian agricultural policy because, in addition to ending the Western Grain Transportation subsidy, it meant the total reconstruction of farm

support programs. Gone are the Western Grain Stabilization program, the Tri-Partite livestock stabilization program, Feed Freight Assistance, GRIP (Gross Revenue Insurance Program), the Canadian Dairy production subsidy, and others. What remains is a set of fairly low-level farm income support programs that do not appear to distort market signals.

The policy adjustment in the United States has been less substantial because the major income support programs for feed grains, oilseeds and wheat were excluded from the amber category on the grounds that they include withdrawal of resources from production. Thus their adjustments, such as removal of target prices for feed grains and wheat, result much more from domestic fiscal considerations than from WTO commitments. Similarly, high tariffs for dairy, sugar and other waiver commodities mean little change in domestic programs for these products, at least until the 15-year phase-in of access for Mexico begins to have significant effects.

Most of Mexico's policy changes occurred in conjunction with the market access provisions of the agreements, but in this area a major change in social policy was made by amending the constitution to reduce the protection of *ejidos*, traditional farmers who produce mainly corn and edible beans.

Technical Regulations

CUSTA identified a number of areas of technical regulation for which joint working parties were established that were to investigate the possibility of harmonizing regulations. For the most part, it appears that the emphasis to date has been on investigating. The WTO and NAFTA adopted the Montreal Accord which established a series of important principles for sanitary (meat and animal) and phytosanitary (plant) regulations. The authors' interpretation of these principles is that:

- Technical regulations are not to be used as non-tariff barriers;
- The principle of equivalence is established—if two countries' standards are worded differently, but have the same effect, then they are regarded as equivalent and cannot be used to stop entry;
- In situations of dispute, science will be used to determine equivalence; and
- This will be done in the context of a NAFTA or WTO dispute panel, whose decisions are binding.

It is important to underline that this applies only to the two aforementioned areas of technical regulation. But the principles are all extremely important as precedents.

Dispute Settlement

Dispute settlement procedures have long been an issue of dispute (van Duran and Martin; Martin, Amanor-Boadu and Stirling). The legal and economic basis for leveling punitive tariffs to offset the effects of dumping or government subsidies by exporters had long been part of the *GATT Subsidies and Anti-Dumping Codes*. However, GATT's dispute settlement process was soft because appeal decisions by

GATT panels were not binding. At the same time, most countries developed their own dispute settlement procedures, based on domestic legislation as well as on the GATT codes. In most cases, these settlement procedures included both the original decision process and the attendant appeal process. A strong perception prevailed among many countries that procedures of some nations were thinly veiled instruments of protection. CUSTA and NAFTA left the basic procedures the same as they were, but replaced the appeal mechanism with bi- or tri-national panels. These panels have altered the outcomes of several important cases to date, and their decisions are slowly becoming part of the body of precedents for original decisions.

WTO now provides both a dispute settlement mechanism and an appeal process when there is a dispute between member nations. For the first time, WTO decisions are binding and, as indicated above, their jurisdiction has been extended into new areas such as technical regulation.

Clearly, the evolution of international trade agreements has been accompanied by a major change in not only border measures, but also the domestic policies of the NAFTA countries, especially Canada and Mexico. In some cases the changes in domestic policy were a result of trade agreements, in others they resulted from fiscal or other internal considerations. In the next section the effects of these policy changes on competitiveness among countries is analyzed.

Competition Policy Affecting Agriculture and Food Sectors

Competition policy within countries may have an influence on long-term trade flows among countries. With regard to competition policy, it may be that the influence in the longer-term is not just the policy per se but how vigorously it is enforced by the federal government within a country.

United States. Competition policies for purposes here are considered broadly defined and therefore include both policies directly dealing with competition, such as antitrust laws, as well as policies only indirectly related to competition, such as laws to redress problems of information asymmetry at the producer-first handler level. The category represents a group of "indirect" policies which ultimately has the legislative intent to promote competition by influencing the balance of economic power at the producer-first handler level. Competition policies are defined here to include the following policy subcategories:

- antitrust,
- trade practice regulation, and
- public price reporting and market information.

For the United States, the set of antitrust policies which bears directly on economic power begins with the Sherman Antitrust Act of 1890 and continues through the 1970s with additional interpretations of Capper-Volstead from a rather complex set of case law (Levi and Sporleder, 1978). Recognition of the lack of market power for farmers was acknowledged in the Clayton Act of 1914 and ultimately lead to passage of the Capper-Volstead Act in 1922. This Act is the cornerstone of contemporary

antitrust policy regarding producer-first handler economic power. The economic logic of Capper-Volstead, in an antitrust sense, is to allow producers to form organizations with countervailing power because bilateral oligopoly is more desirable from society's standpoint than oligopsony.

Without Capper-Volstead, groups of farmers in joint marketing organizations such as milk cooperatives could have been held to be an illegal contract or combination in restraint of trade, in violation of either the Sherman Act or statutes in several states. Antitrust legislation recognizes that farmers can face monopsony power by first handlers, and implicitly recognizes that this may be especially acute in the case of perishable products.

The legislation influencing the nature of trade practices and public market information legislation are two other significant sets of policies aimed at the balance of economic power. The set of trade practice policies include, but are not limited to, unfair trade regulation, prompt- and full-pay provisions, truth-in-trading requirements, and discriminatory practice regulation (Knutson, Geyer, and Helmuth, 1983, p. 240). Legislation includes the Packers and Stockyards Act, the Commodities Futures Trading Commission Act, the Perishable Agricultural Commodities Act, the Agricultural Fair Practices Act, and the United States Warehouse Act, among others.

From an economic standpoint, both market information and trade practice regulation are policies intended, among other things, to redress information asymmetry stemming from oligopsonistic or spatially-monopsonistic structures at the producer-first handler level. The notion is that collection of unbiased and statistically-accurate market information promotes competition in the long-run. In general, public price reporting is justified on grounds of promoting competition, efficiency, and fairness as well as providing the federal government with information it needs for monitoring and regulatory purposes (Henderson, Schrader, and Rhodes, 1983, p. 22).

The subcategory of market information is interpreted broadly here and means any policies that improve market information to either producers or consumers. Accordingly, policies such as food labeling regulations and grades and standards facilitate efficiency and pricing accuracy and encourage competition throughout the food production and marketing system.

In summary, from a U.S. perspective relative to antitrust, much of the antitrust complaint has been based on legal actions of one rival firm against another. In the 1960s and 1970s much of the antitrust complaint activity was initiated by the federal government and thus was government versus firm. For whatever reason, the federal government complaint activity has diminished over the past several decades except for a few highly visible cases (e.g. American Telephone & Telegraph).

Canada. Canada continues to have a fairly strong competition policy compared to many other developed countries. In an extensive recent review of competition policy in Canada, Robertson, et al., analyzed 197 interventions made by the Bureau of Competition relative to all industries in Canada (Robertson, et al., 1997). These were all the interventions between 1975 and 1995. Of these 197 interventions, only 13 were

related to agriculture or value-added downstream firms (about 6 percent). Thus, even though the legal base is solid in Canada, the recent record of antitrust restraint from the federal government has been minimal relative to the agri-food sector of the economy.

FTAA. The purpose of freer trade within the Western Hemisphere is embodied in the FTAA. Part of the agenda of initial meetings among FTAA country officials has been the following: 1) to better understand the objectives and operation of competition policies, 2) compile an inventory of domestic laws and regulations that deal with anti-competitive conduct, 3) identify mechanisms for cooperation in the WH aimed at assuring effective implementation of competition policies, 4) exchange views on the application and operation of competition policy regimes in the countries of the Hemisphere and their relationship to trade in a free trade area, and 5) to make specific recommendations on how to proceed in the construction of the FTAA regarding competition policy.

The FTAA is composed of all countries in the WH except Cuba. The purpose is to eliminate or lessen trade barriers within the region. Since the initial meeting of the Summit of the Americas in December 1994 the members have been meeting regularly. A target is to complete trade negotiations for the agreement by 2005.

There are three key components to the FTAA: 1) the Trade Ministers of the WH responsible for development of the overall plan for the FTAA, 2) the twelve FTAA Working Groups established by the Trade Ministers responsible for gathering and analyzing information on the current status of trade, and 3) the Vice Ministers of Trade of the WH responsible for coordinating activities of the Working Groups and eventually to make recommendations to the Trade ministers. The Working Groups are centered around these topics: market access, harmonization of customs procedures, investment, standards and technical barriers to trade, sanitary and phytosanitary measures, countervailing duties, intellectual property rights, and competition policy.

The promise of economic integration within the WH is substantial. However, progress inevitably will not be as rapid as the ambitious target dates established. Clearly, the objective long term is to minimize national boundaries within the WH for purposes of trade and commerce. It is a direction that the United States and most other developed countries in the world applaud.

THE IMPORTANCE OF AGRICULTURAL TRADE AND AGRICULTURAL AGREEMENTS

The era of liberalized trade through international agreements clearly means that at the end of the 1990s the policy environment is very different than at the end of the 1980s. Especially in the case of Canada and Mexico, these changes go well beyond border measures. In Canada's case, a country of 30 million people spread across 5,000 miles suddenly gained access to, first, 250 million Americans and then 85 million Mexicans. This occurred at the same time that domestic protection was

declining in Canada and a large number of market distorting public programs were being dismantled. Essentially, for both agri-food industries, the entire set of economic incentives was altered. Three examples of these exchanges are addressed briefly below.

Canadian Case Examples of Induced Technological and Structural Adjustment

A freer trade environment in Canada increased and changed the location of effective demand for agricultural commodities—especially wine and tomato products. Some adjustments were made for "demand-pull" reasons. However, the insulated conditions in which these industries were operating, with rents provided through protection or subsidy, changed markedly. Producers at both the farm and processing levels saw the incentive system change and, therefore, adopted technology to enhance their competitiveness. Three case examples are of relevance to the analysis.

Wine. A highly protected environment allowed producers to make poor quality wine, disallowed consumers from having open access to high quality wine, and produced a government program that continuously subsidized production of plonk grapes. Freeing it after losing a trade dispute came at the same time as a few in the industry were doing some R&D to try to adapt *vinifera* grapes to Canadian growing conditions. It worked. A quality program was instituted. A highly effective promotion program was developed. The plonk wine industry has basically been eradicated. Canada now exports to a large number of countries. There is a continuous new investment in wineries and wine making. The industry's biggest problem is to get enough production to meet the demand. Technology changed as a result of policy change.

Tomatoes for Processing. The tomato processing industry in particular, and vegetable processing in general, was characterized by low-technology, inefficient plants and substantial organizational slack. In 1988, the average yield in Ontario for tomatoes for processing was 18 tons / acre, while in California it was 32 tons / acre. After CUSTA, firms invested over $100 million in new flumes, others closed, and all went through process re-engineering. The pricing mechanism changed to encourage, through substantial price discounts, higher farm yields. Farm yields were largely in control of the processors because they selected the varieties and production practices for their contract growers. When the incentives changed, so did their use of technology through plant breeding research that quickly found varieties far better for Ontario conditions than those that had previously been imported from Georgia. As a co-benefit, members of Ontario's greenhouse industry have now become exporters of seedlings (Mumford, 1998).

One dramatic result is that HJ Heinz's yields during the 1997 season averaged 37.8 tons / acre, while California's was 33. Heinz is easily the largest tomato processor in Canada. At the same time, the system encouraged small contracts to amalgamate and use mechanical harvesters. Total cost has declined by about 30 percent at the farm level, and productivity is improved in processing. Heinz closed its

Tracy, California plant, stopped tomato paste processing in its Ohio plant, and is expanding its Leamington, Ontario plant. Without question, there was a technology-induced change from the policy changes.

Western Canada. After almost a century of substantial transportation subsidies for raw grain moved off the Prairies to Pacific and Great Lake ports, the subsidies were finally ended in 1995. As a result of this and other policy changes, acreage of barley and wheat is trending downward; acreage of canola, field peas and other "specialty" crops is increasing. There is significant investment in "value adding" industries such as livestock production—6-8 percent per year expansion in hog production on the prairies. Again, a major change in technology accompanied a major change in policy.

Effects on Commodity Trade Flows between Canada and the U.S.

Not surprisingly, the removal of trade barriers and changes in domestic policy have had a substantial effect on trade between Canada and the U.S. Figures 1–12 show trade patterns since 1989, the first year of CUSTA, for the sector in general and for several key agricultural industries. (All figure data was taken from Statistics Canada's Merchandise Trade Database).

Figure 1: Canadian Agri-Food Trade with the United States

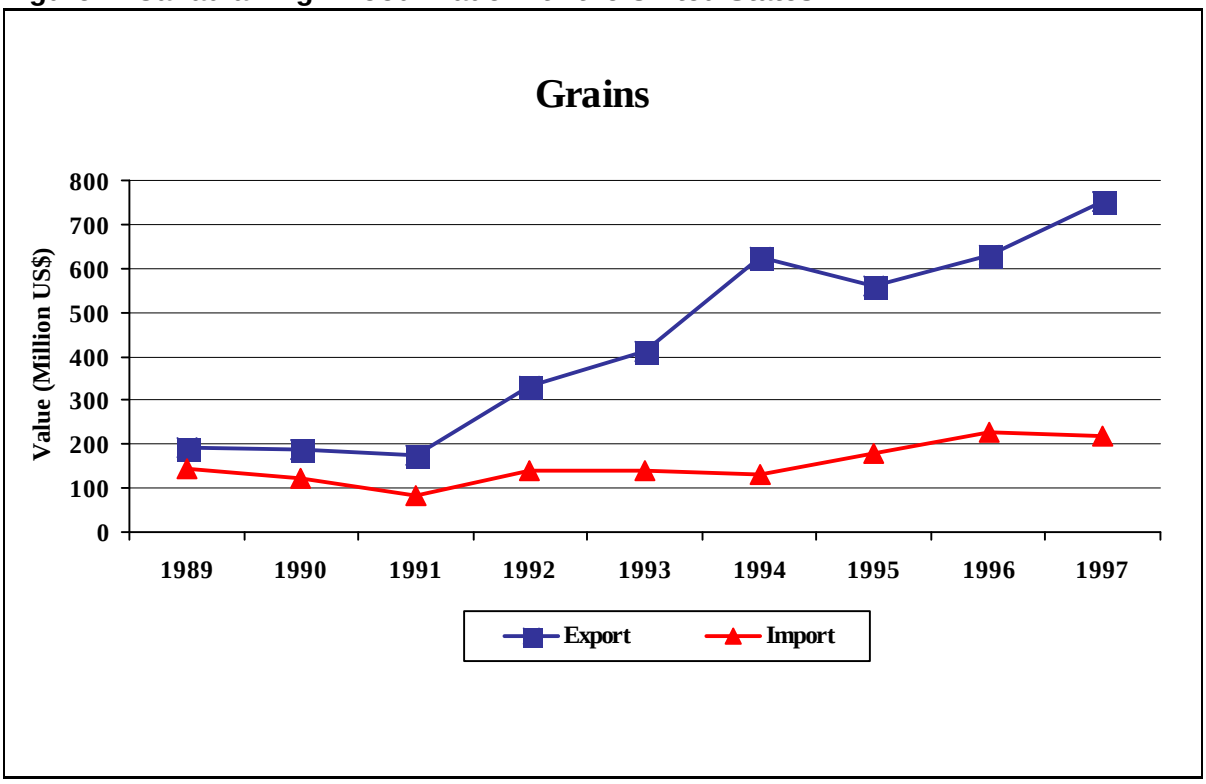


Figure 2: Canadian Agri-Food Trade with the United States

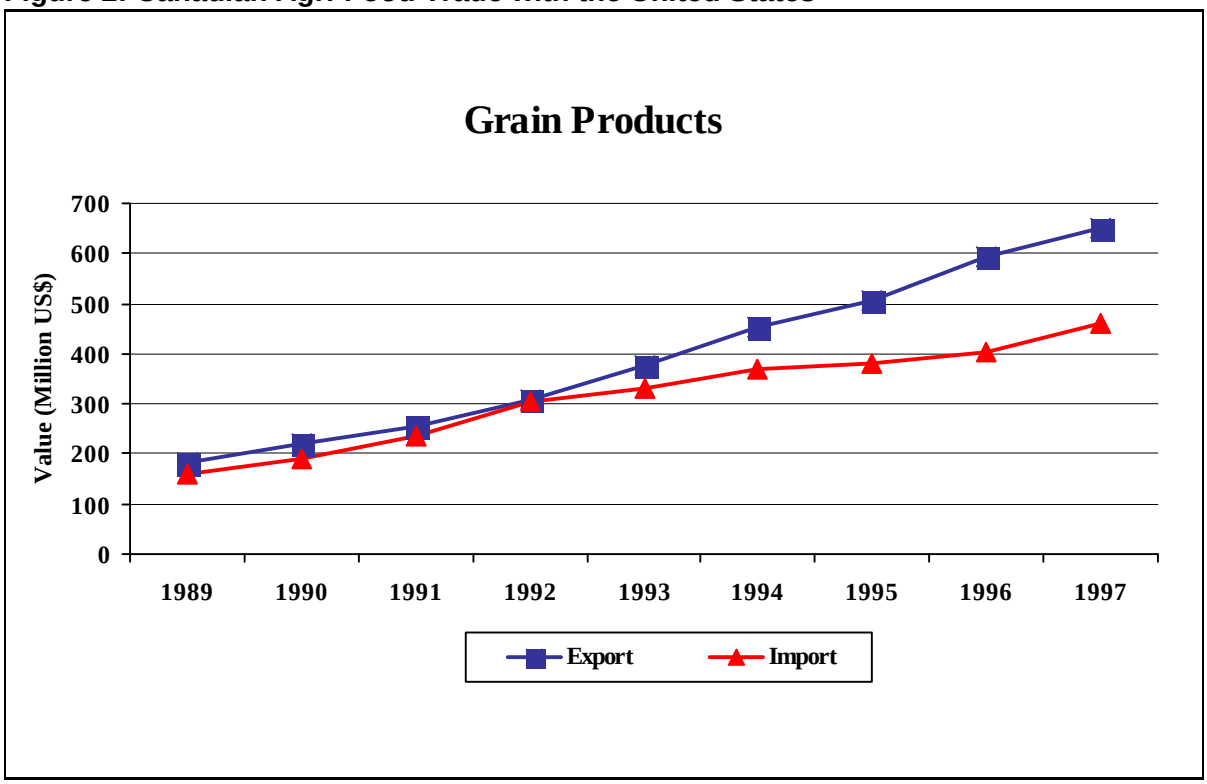


Figure 3: Canadian Agri-Food Trade with the United States

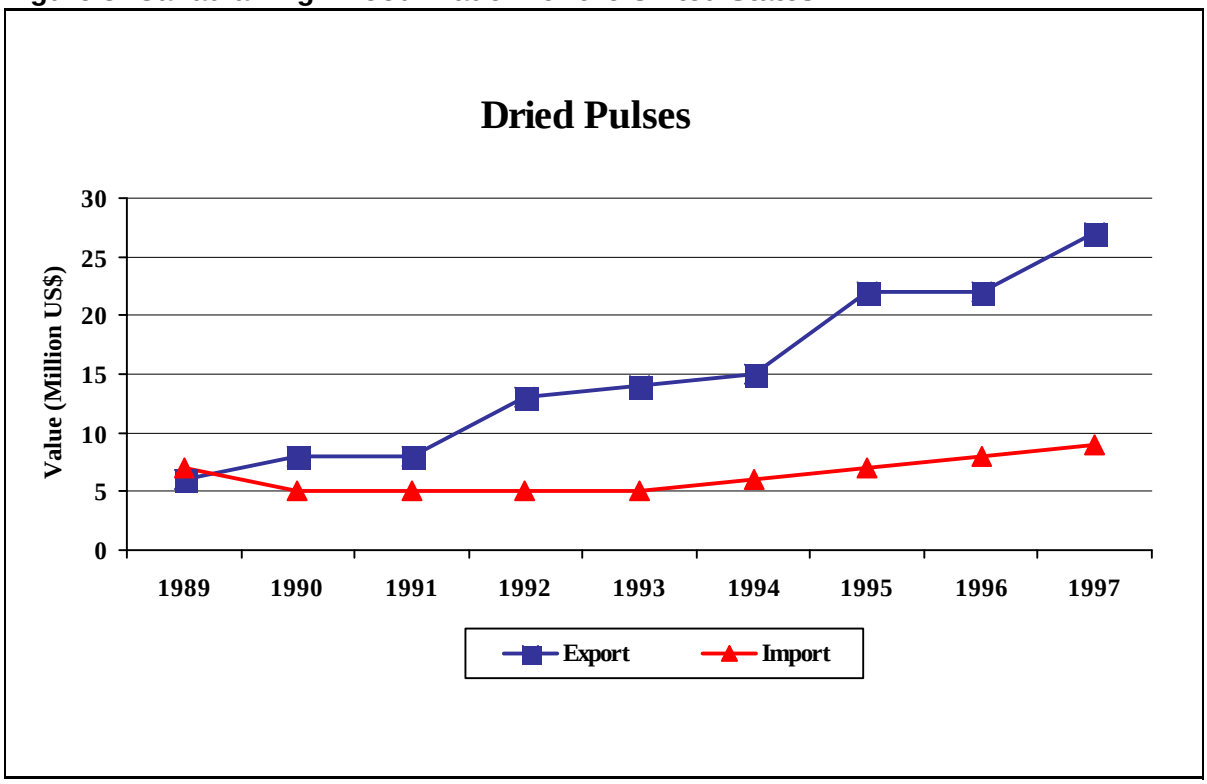


Figure 4: Canadian Agri-Food Trade with the United States

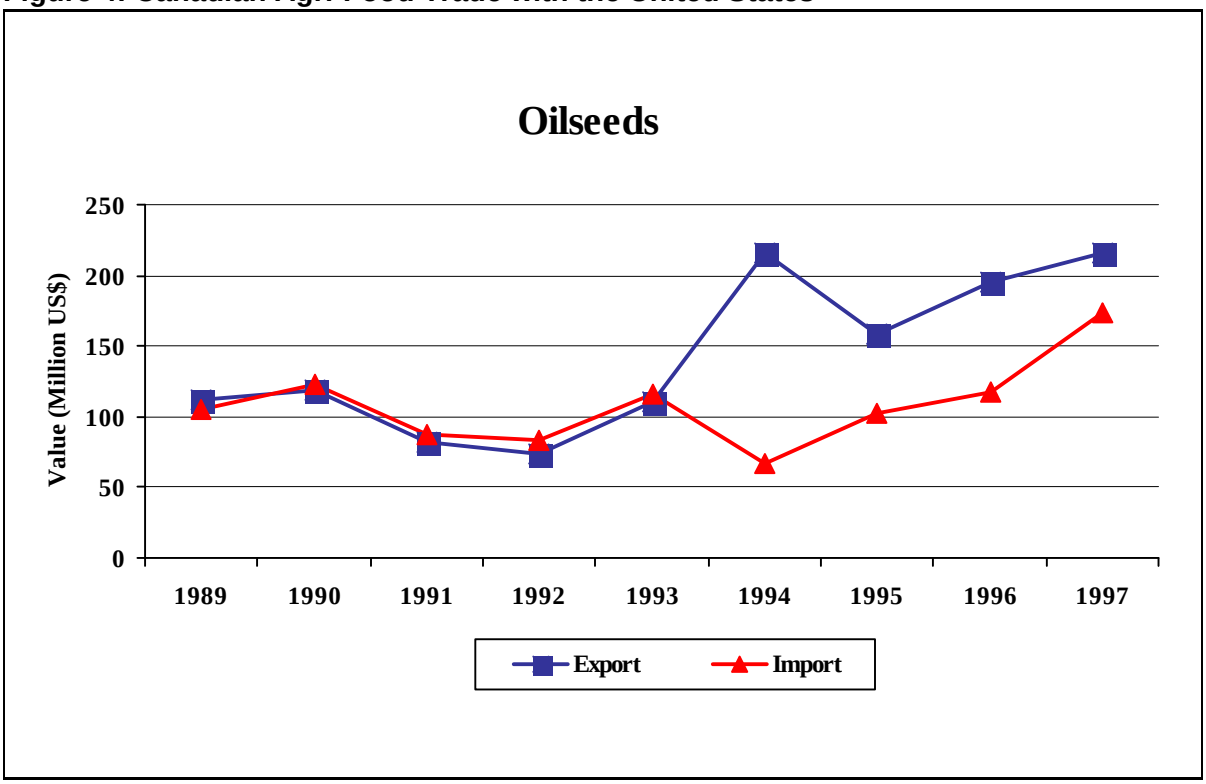


Figure 5: Canadian Agri-Food Trade with the United States

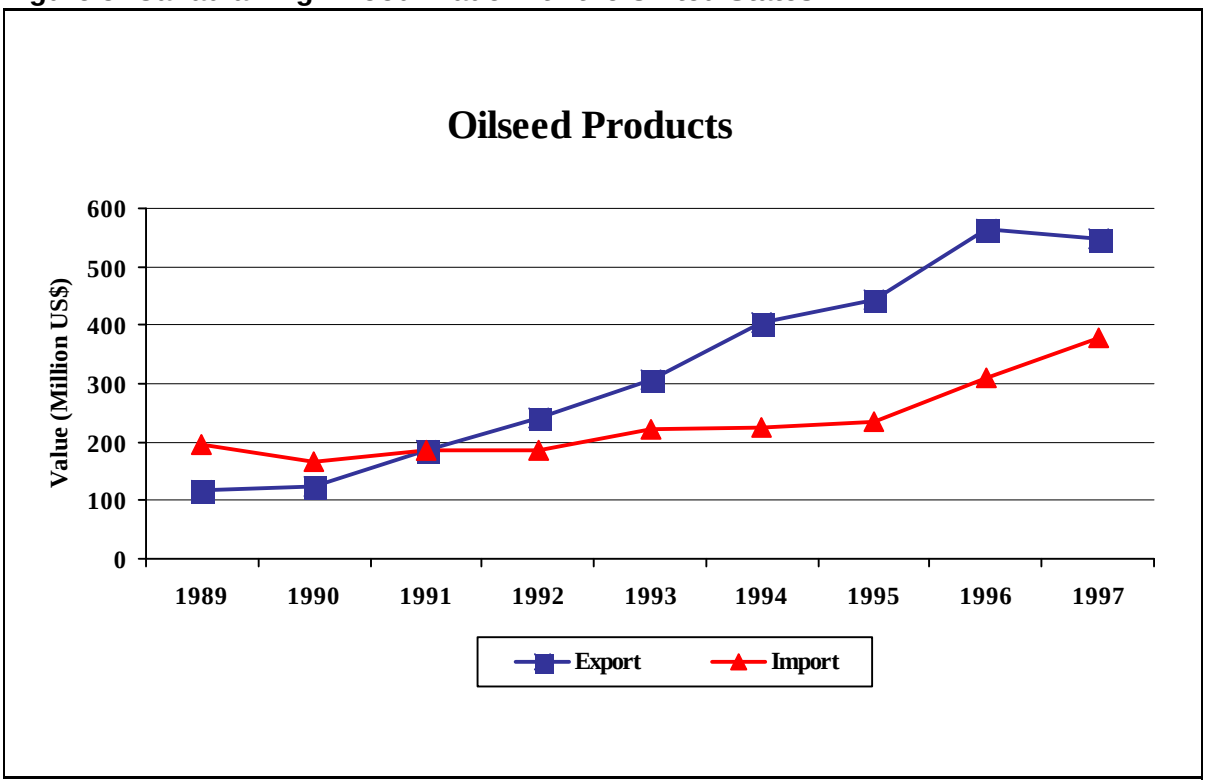


Figure 6: Canadian Agri-Food Trade with the United States

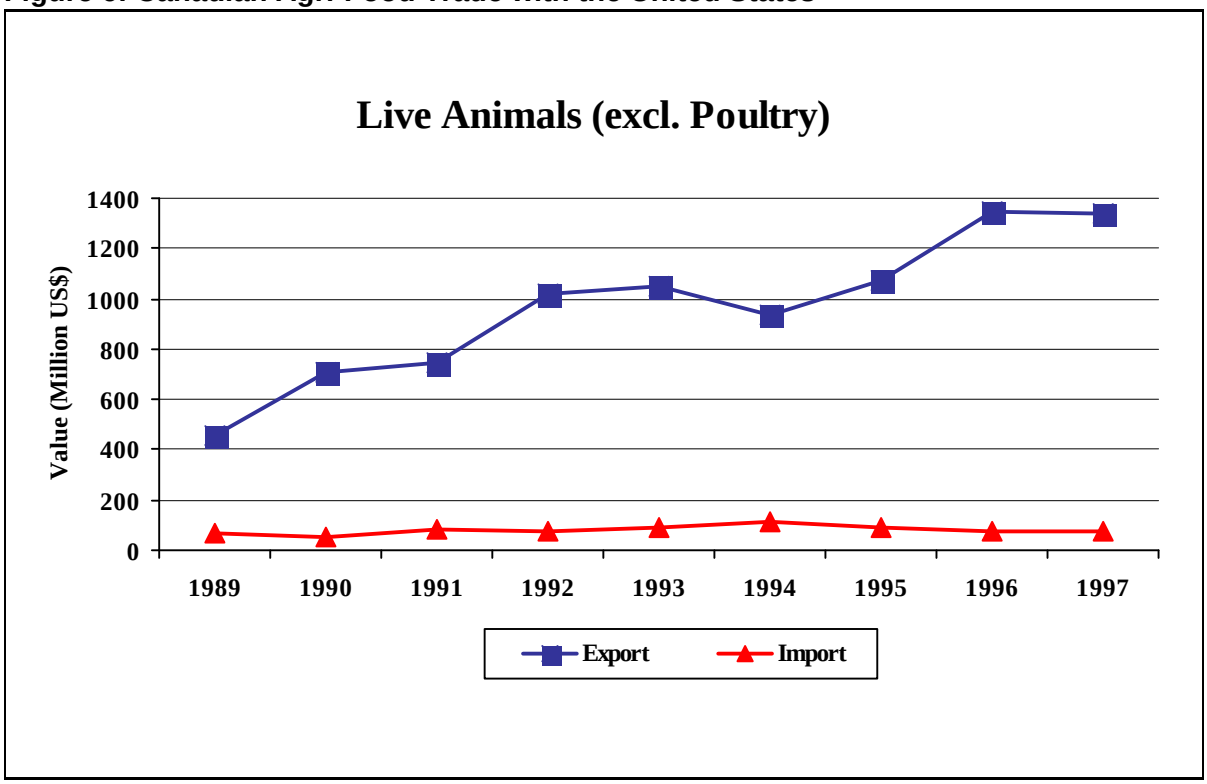


Figure 7: Canadian Agri-Food Trade with the United States

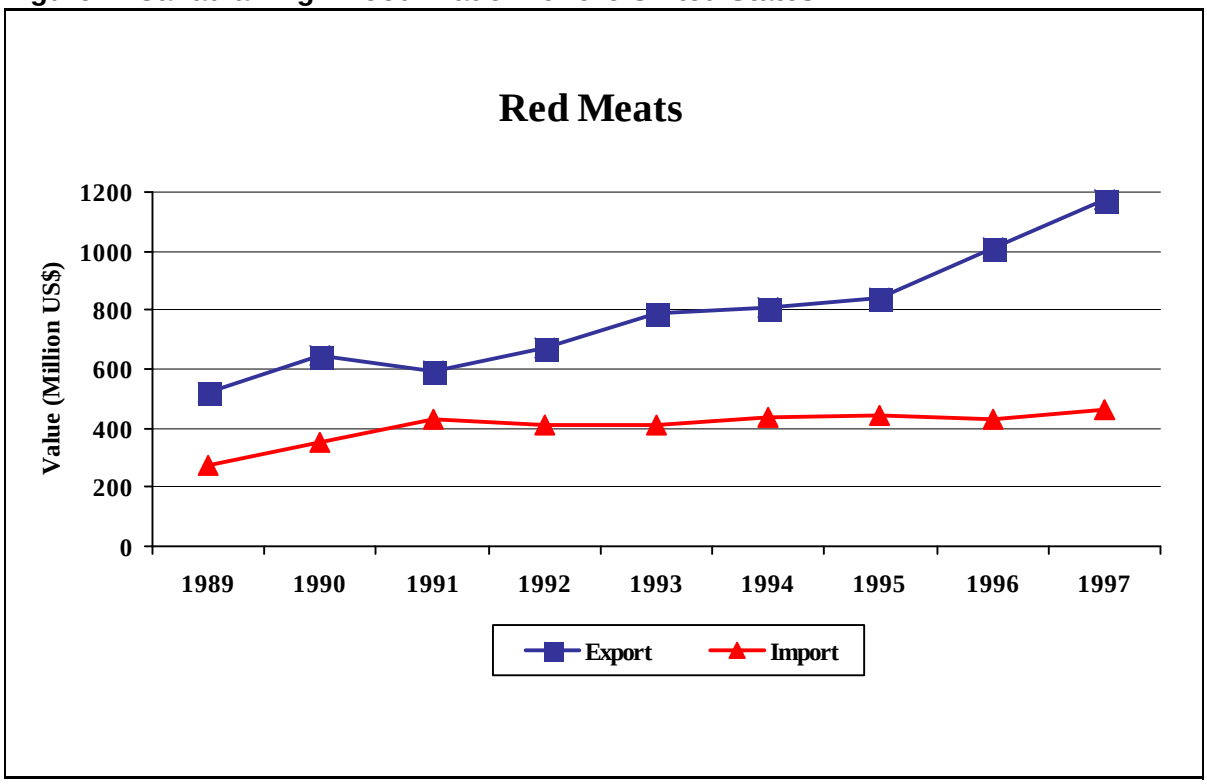


Figure 8: Canadian Agri-Food Trade with the United States

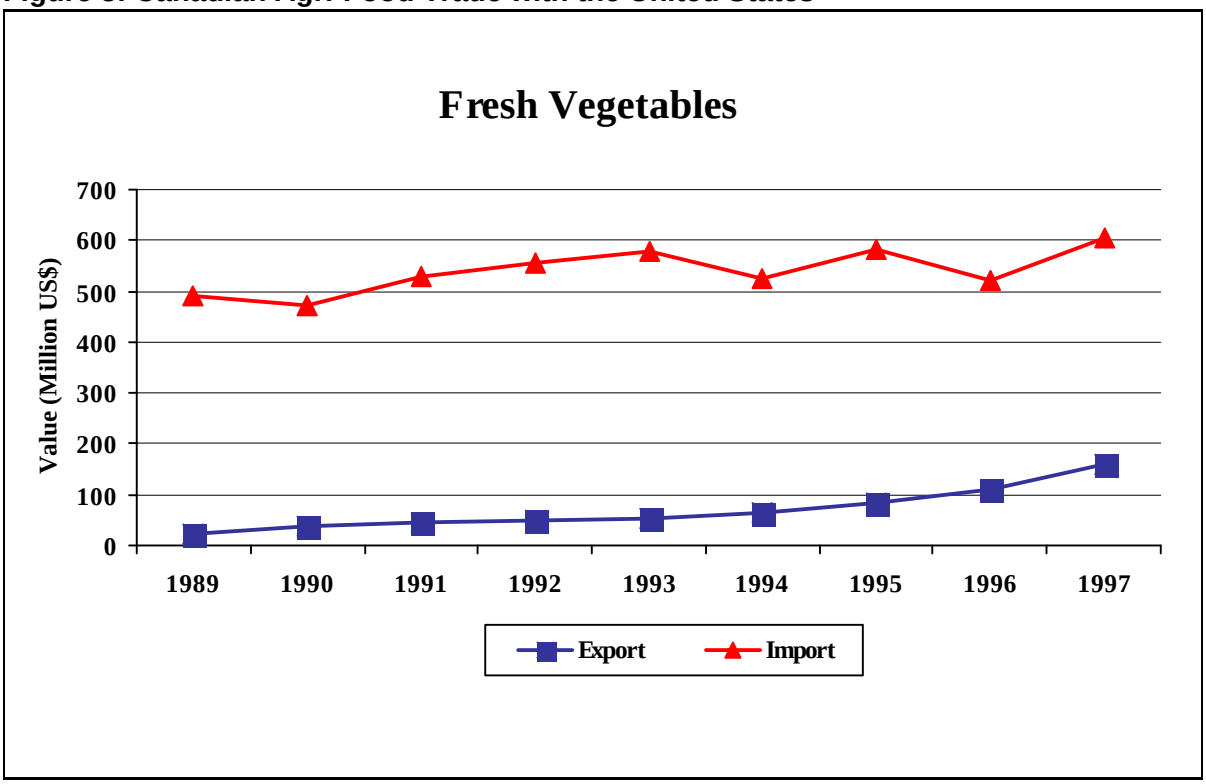


Figure 9: Canadian Agri-Food Trade with the United States

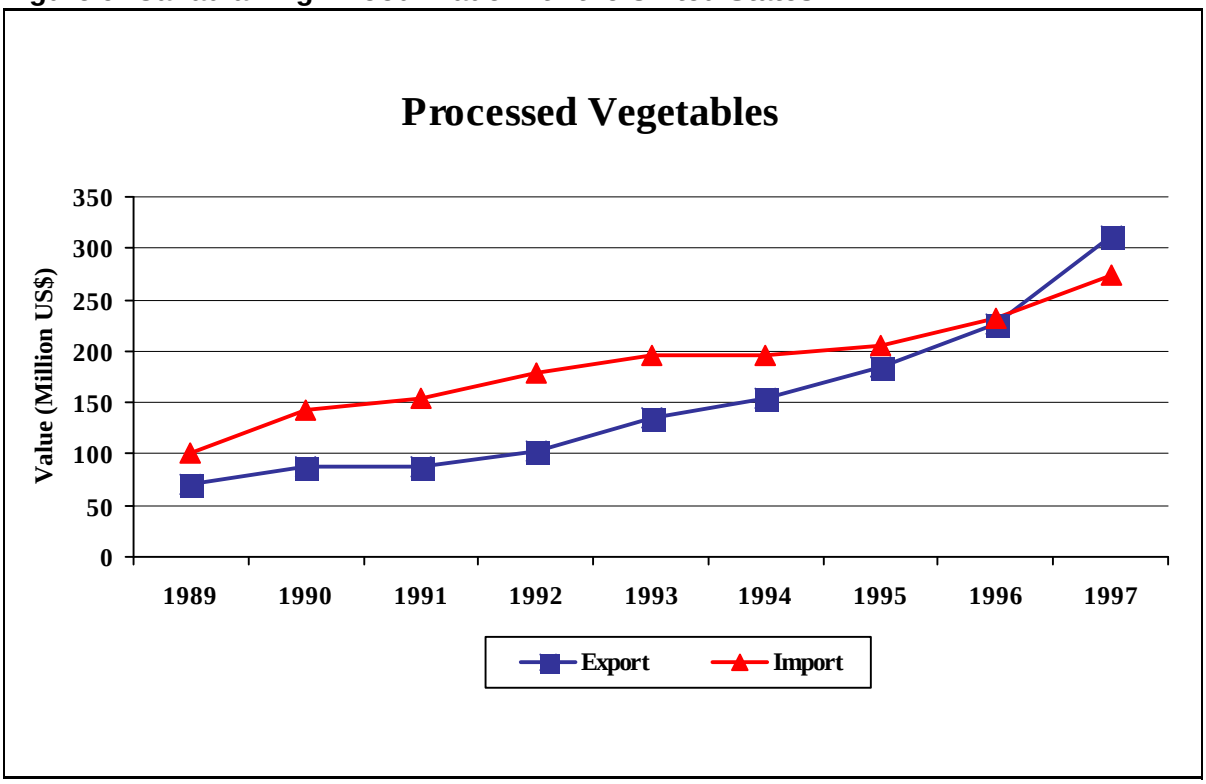


Figure 10: Canadian Agri-Food Trade with the United States

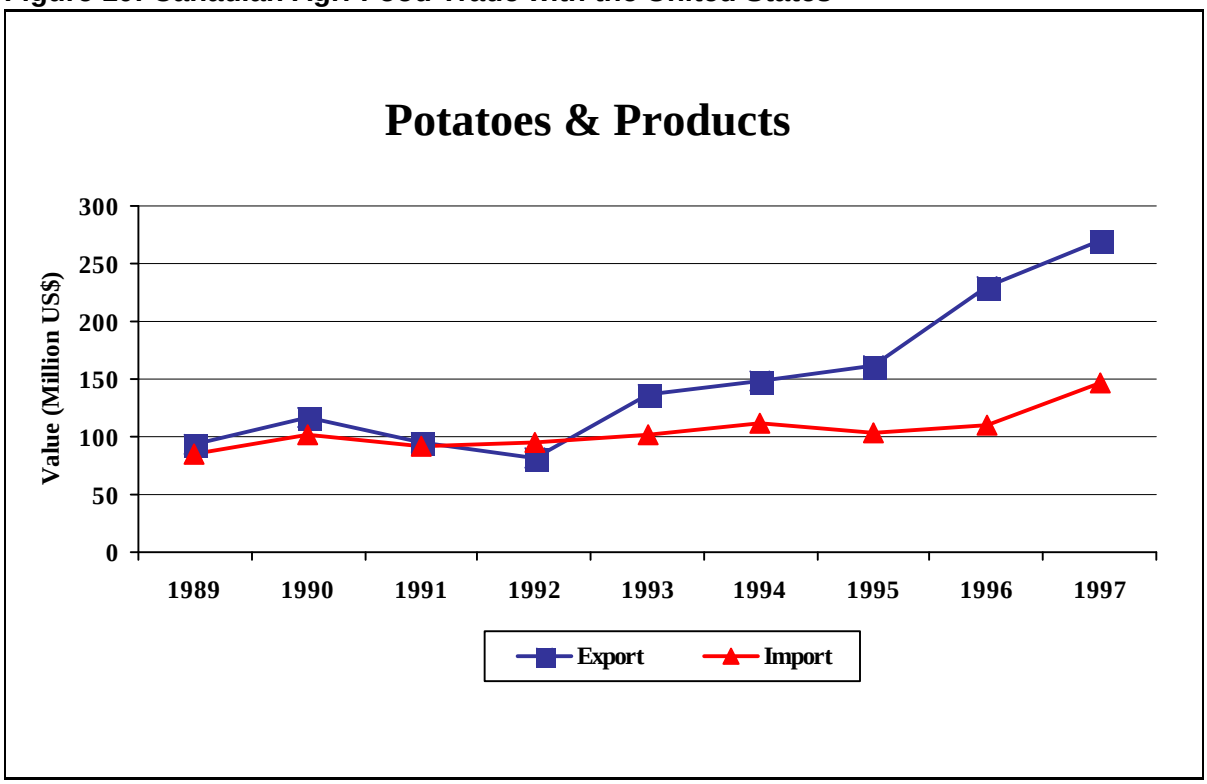


Figure 11: Canadian Agri-Food Trade with the United States

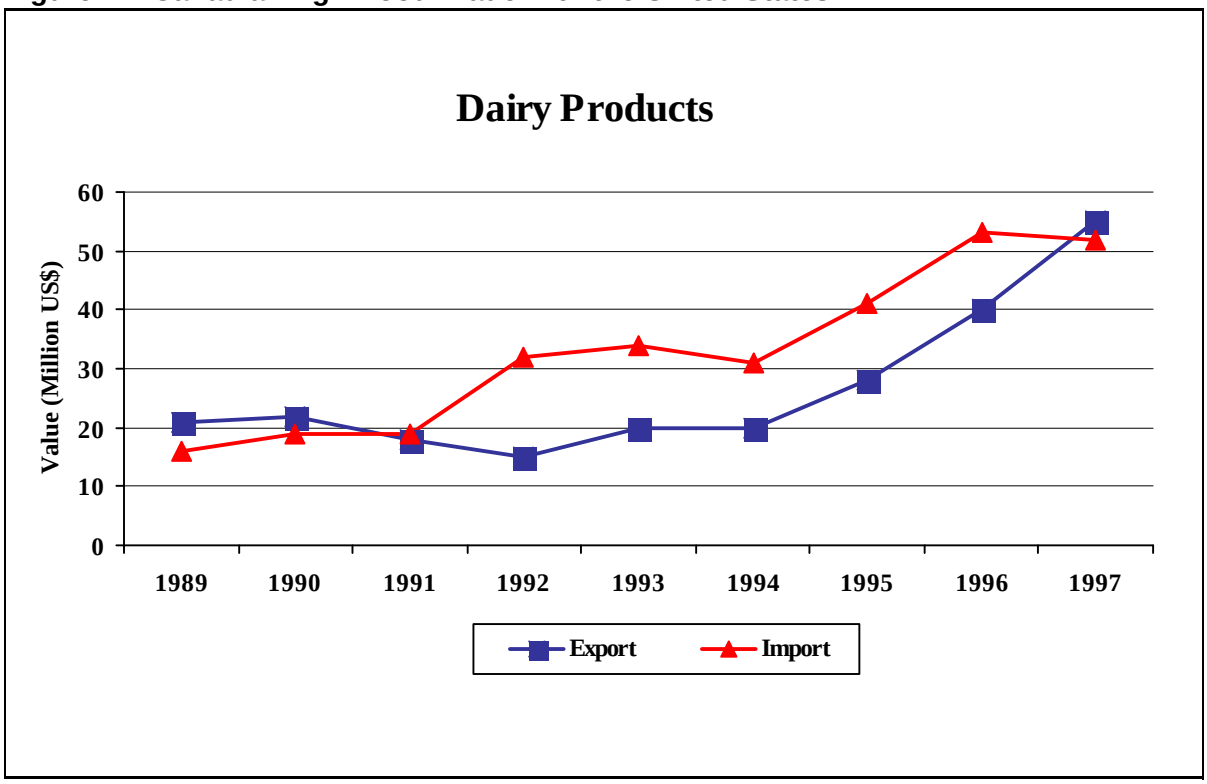
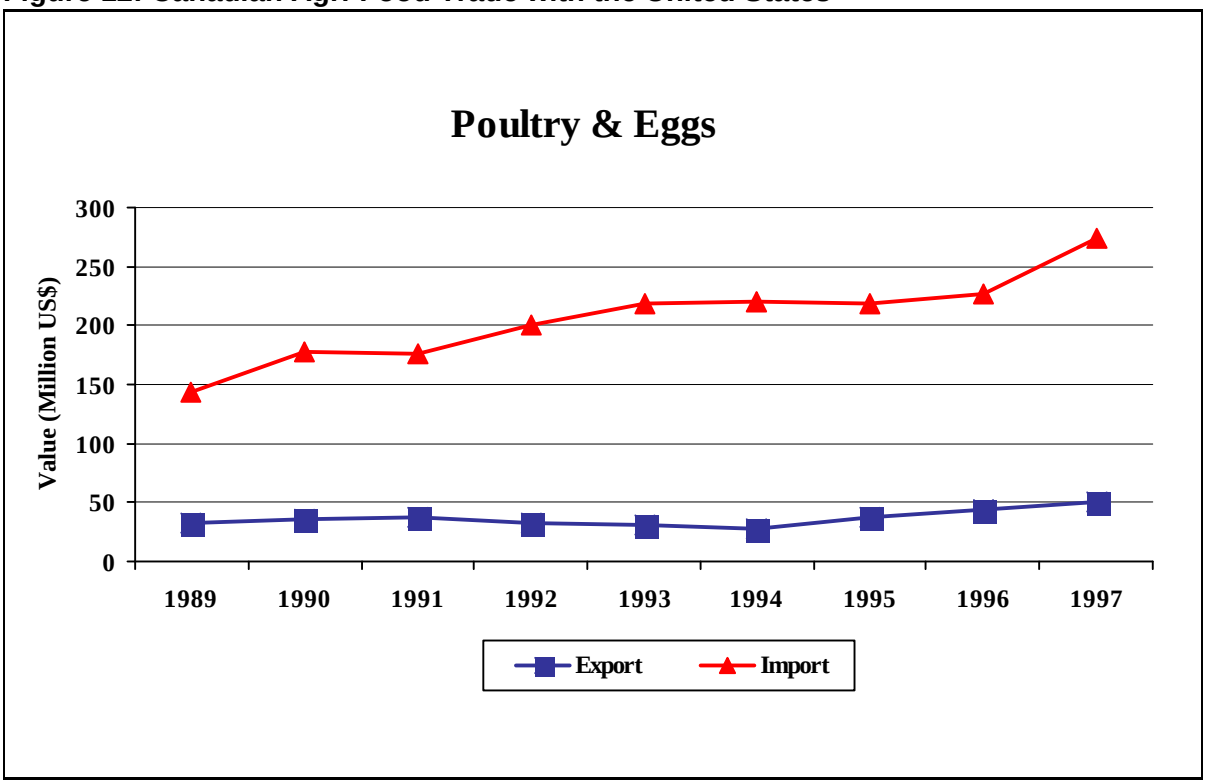


Figure 12: Canadian Agri-Food Trade with the United States



Data on a commodity basis suggests the following:

- The value of Canadian grain and grain products shipments to the U.S. tripled, while U.S. shipments doubled.
- Canadian dried pulp exports tripled, while U.S. exports stayed flat.
- Canadian oilseed exports essentially doubled, while U.S. exports trended sideways, Canadian product exports grew by a factor of 5.5, while U.S. exports increased by 50 percent.
- Canadian exports of cattle and hogs tripled, while U.S. exports stayed flat; Canadian meat exports doubled, while U.S. exports increased by about 25 percent.
- Canadian vegetable exports doubled, but remained at a relatively low level, while U.S. exports increased by about one-third. Proportionately, the same occurs for potatoes and potato products, but in this area Canada has taken the trade advantage.
- Interestingly, the two commodities in which the United States has outperformed Canada in mutual trade are dairy and poultry.

FUTURE CHALLENGES TO HARMONIZATION IN THE NEXT WTO ROUND

Trade negotiations are dynamic and always responding to new situations. So it is with the WTO. Our assessment is that several leading issues may present challenges to harmonization within the next WTO Round:

- *Genetically Modified Organisms* (GMOs) will be important in terms of establishing science-based rules of trade for products derived from genetically modified organisms (biotechnology based products). An ever-increasing portion of U.S. farm and food exports will contain, or be derived from, genetically engineered products. Since GMOs are being approved more rapidly in the U.S. than in most other countries, especially the EU, the potential exists for trade disruption centered around GMOs. The prospect of EU discrimination could set an example for much of the developing world.
- *State Trading Enterprises* (STEs) will be the focus of some attention in the next round of negotiation. The potential for trade distorting practices of STEs will be a challenge, especially in light of the possible accession to the WTO of China, Russia, and other nations that engage in state or quasi-state trading of agricultural or food products. Marketing boards in particular, such as the Australian and Canadian Wheat Boards and the New Zealand Dairy Board, may be contentious relative to harmonization.
- *Market Access* will present a challenge through TRQs and levels of tariffs. Some countries have allowed TRQs to go unfilled due to restrictive measures while others have failed to introduce "tariffication." The tariffication process has been circumvented via restrictive rules on access to tariff-rate quotas. A NAFTA panel ruled in favor of Canada's application of tariff-rate quotas on imports of U.S. dairy, poultry, eggs, margarine, and barley.

CONCLUSIONS

This paper broadly focused on the substantive economic changes that the Canadian-United States Trade Agreement (CUSTA), GATT/WTO, and the North American Free Trade Agreement (NAFTA) have encouraged. Special emphasis was placed on changes within and among Canada, the United States, and Mexico. In addition, some potential implications from the newer Free Trade of the Americas (FTAA) effort were analyzed. These policies were examined broadly in relation to their influence on trade flows and competitiveness.

With regard to Canada and the United States, the most important policies in the past decade center on CUSTA and NAFTA. The authors conclude that CUSTA spurred significant structural adjustment compared to NAFTA. In fact, recent empirical analysis indicates that after controlling for the effects of income, exchange rates,

and prices on aggregate trade flows, NAFTA has a significant positive influence on trade flows between the United States and Mexico but not the United States and Canada.

From the Canadian perspective, NAFTA is not a good starting point about the policy effects on Canada/U.S. agri-food trade flows. Canada was substantially affected by the Canada-U.S. agreement (CUSTA), and substantial adjustment occurred between 1989 and the implementation of NAFTA. All NAFTA did, with a few exceptions, was extend the same access to Mexico as CUSTA did to the United States. Canada phased out tariffs completely on most products starting in 1989 over either five or ten years. Tariffs were high on processed products on both sides of the border. Hence, the effects were mainly on trade in intermediate and further processed products. The same also is true for U.S. exports to Canada. One effect of this is to change the trade balance in Canada's favor.

In a highly protected environment, one reaction—at least in Canada—was to erect cartels, or concentrated markets with a high degree of organizational slack. One effect was to reduce the adoption of technology.

From an agribusiness perspective, globalization of the food trade has been facilitated by freer trade as embodied in agreements including CUSTA, NAFTA, the WTO, and the FTAA. The response has been international diversification of food processors, and to a lessor extent food retailers, in developed countries. International and product diversification play key roles in the strategic behavior of large firms. Food processors have become increasingly multinational. Multinational firms exploit opportunities to integrate across political boundaries by standardizing products and achieving economies of size through coordinating critical resource functions such as R&D. Also, the drive for coordinative and cooperative relationships among vertically-allied firms may be motivated partly by searching for exploitable first-mover advantages over rivals with regard to resource supplies or core competencies. Strategic partnering has evolved rapidly, partly as an effort by firms to effectively and efficiently gain multinational status.

In the authors' opinion, harmonization of domestic policies within the WH still presents a challenging task. In this paper, competition policies were interpreted broadly to include laws and regulations that intended to redress information symmetry within commodity marketing channels. The totality of competition policies may conflict with or complement trade policy. Substantial differences exist among NAFTA countries, let alone among WH countries.

NAFTA countries are stakeholders in the several challenging future issues regarding the next WTO round. These include Genetically Modified Organisms (GMOs), State Trading Enterprises (STEs), and market access. Each issue has the potential to disrupt future agri-food trade among WH countries.

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ECONOMIC PERSPECTIVES ON COMPETITIVENESS UNDER WTO, NAFTA, AND FTAA

Murray Fulton

INTRODUCTION

Sporleder and Martin have provided a number of very useful perspectives on competitiveness under the World Trade Organization (WTO), North American Free Trade Agreement (NAFTA), and the Free Trade of the Americas (FTAA). I will focus my comments on three of the points they raise in their paper. These points are:

1. trade agreements have had some very powerful effects on certain segments of the agricultural sector in Mexico, Canada, and the United States;

2. there are important interactions among technological change, intellectual property rights (IPRs) and trade that need to be considered when examining trade agreement effects; and

3. competition policy and regulatory schemes that encourage contestability will be increasingly important as agriculture is industrialized.

EFFECTS OF TRADE AGREEMENTS

The paper provides three examples—wine, tomato processing, and western Canadian agriculture—of how trade agreements induced substantial structural adjustments in certain segments of Canada's agricultural industry. I would like to expand on the changes occurring in the grains industry of Western Canada to drive home the point that trade agreements can have some fairly major impacts.

Although the causal link is not always clear and there are many contributing factors, both the Canada-United States Free Trade Agreement (CUSTA) and the WTO have either led to or have been part of the reason for the following changes in the Western Canadian grains industry:

- opening of the Canada-United States border to trade in grain, which in turn has led to cross-border sales and trade disputes between Canada and the United States;
- the removal of the *Western Grain Transportation Act* (WGTA) and the partial deregulation of the rail industry (Vercammen, 1996);

- calls for new pricing and regulatory structures for the rail industry (Fulton and Gray);
- pressure for changes to the Canadian Wheat Board;
- consolidation of the grain handling system;
- an expansion of the hog industry using a new production technology;
- mergers in the processing (milling and malting) and grain handling sectors, as well as direct foreign investment by multinational firms (Adams and Young, Bushena and Gray); and
- changes in the crop mix.

The above list of changes is instructive in that it includes aspects such as changes in crop mixes that are traditionally modeled as being affected by trade agreements. The list also includes aspects—such as mergers, consolidation, and the demand for new regulatory structures—that are not usually viewed as being linked to trade agreements. Clearly, however, trade agreements have an effect not only on prices and quantities in an industry, but also on the organizational and institutional structure of the industry. Understanding the linkage between trade agreements and the organizational and institutional aspects in something to which more attention needs to be focused.

AGRICULTURAL INNOVATIONS AND IPRS

As Sporleder and Martin point out in their paper, technological change has been a key factor in agricultural development. Although there have been exceptions, technical developments have historically been financed by publicly-funded research. This situation, however, is changing. Currently, a sizable and increasing proportion of agricultural research and development (R&D) is being done by private companies (Moschini and Lapan, 1997).

Private firm research differs from publicly-funded research in that it is protected by various forms of IPRs. These IPRs—whether they be patents, licensing agreements, or trade secrets—confer some monopoly rights to the discoverer of an innovation (Moschini and Lapan). IPRs also result in economies of scale to the firms that hold them (Fulton, 1997). As a consequence, industries where IPRs play an important role cannot be viewed as being perfectly competitive. Instead, these industries must be understood as oligopolies and the firms in these industries must be viewed as having oligopoly power (Fulton, Moschini and Lapan).

One of the implications of private firms undertaking an increasing amount of agricultural R&D is that agricultural innovations can no longer be viewed as exogenous to agriculture. Instead, R&D expenditures and the innovations they spawn are part of a firm's strategic decisions and are linked with the other activities the firm is

undertaking. As Moschini and Lapan show, this endogeneity has important implications for determining the gains, and the distributions of the gains, from agricultural R&D.

In addition, innovation activity and IPRs form the basis for the formation and the operation of multinational enterprises, vertical integration, strategic alliances, and cooperative R&D. As Caves points out, the most fruitful concept for explaining multinational enterprises and vertical integration is a notion of proprietary assets. Propriety assets—or intangible assets—are nonrival goods that have a high degree of excludability. Examples of these assets include knowledge of how to produce a product more cheaply than other firms of special skills in designing products (Caves, 1996).

As a result of being nonrival, proprietary assets can be used in different locations at the same time. However, attempts to make these assets available to other parties are often prone to market failures such as opportunistic behaviour. As a consequence, firms with proprietary assets often find it most advantageous to establish new operations in different locales to obtain the benefit of these assets. The empirical evidence supports this idea, with foreign investment being strongly influenced by investments in proprietary assets.

Proprietary assets also play a similar role in the decision to vertically integrate, to undertake strategic alliances, or to form cooperative R&D enterprises (Katz, 1986; Caves; Fulton). For instance, in the grains industry, intellectual property and intangible assets are likely to result in pressure on chemical and seed companies to control marketing and distribution, and in pressure on marketing and distribution companies to control seed and chemical products.

The structure of agriculture is also changing because of the nature of the technological innovations that are being undertaken. While all innovation is directed at increasing productivity, many of the innovations also increase the degree of control that we have over biological processes. This greater control results in easier monitoring of the agricultural production process, which in turn has implications for the way the agricultural system is structured (see Hobbs and Kerr in this volume). More specifically, easier and less costly monitoring means the transactions costs associated with contracting (and other forms of vertical integration and vertical coordination) are likely to be reduced, making it more likely that this form of organization will emerge as the most efficient.

In summary, the changing structure of agriculture is influenced by a complex nexus of forces. The trend towards greater private firm funding of agricultural R&D—which will result in additional proprietary assets for the firm—is likely to result in greater foreign investment, vertical integration, and strategic alliances, as well as greater industry concentration. These changes will be aided by the nature of agricultural innovations, by trade agreements, and by the domestic deregulation that is inexorably linked to trade agreements. Many of these developments have a

common origin. For instance, the reduced role of government in funding agricultural R&D, the signing of international trade agreements, and the deregulation of domestic industries are all part of governments' response to fiscal pressures and globalization.

COMPETITION POLICY AND CONTESTABILITY

For at least two reasons, as trade agreements increase in importance, so does competition policy. The first is that competition policy is important in ensuring that trade agreements are not circumvented and that certain firm (e.g., domestic firm) are not given special treatment. Robertson et al. (1997) provide an overview of this aspect of competition policy and trade liberalization in agriculture.

Competition policy is important for a second reason, namely to ensure that the increasing concentration discussed above does not lead to non-competitive activities. The concern over non-competitive activities may be further increased because of the deregulation that goes hand-in-hand with trade agreements.

Although concerns about concentration and non-competitive activities have long been important in agriculture, there are indications that the nature of concentration will be different than in the past. Changes to the way supply chains are organized suggest a greater level of vertical integration and coordination than has been the case in the past (Hobbs and Kerr, 1998). One possible scenario is the presence in a few years of an oligopoly of supply chain firms, with each supply chain firm (or combination of firms) dealing with most of the supply chain from input supply to final processing (and perhaps even retailing). How will these supply chain firms compete? What are the relevant performance issues that need to be examined in such a system? A great deal of research is required to address these questions.

Finally, an observation from other industries such as telecommunications and electrical power. Deregulation in these industries has taken the form of creating contestable markets, markets in which the costs of entry and exit have been substantially reduced. The creation of these contestable markets can be viewed as a supplement to competition policy. The idea of regulation as promoting entry, rather than of setting prices, needs to be considered for certain segments of agriculture where entry is problematic. One example of a segment of agriculture where entry is of a concern is rail transportation (Fulton and Gray).

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Section 2

Structural Developments in the Grain-Livestock Subsector

The objective of this section is to explore the economic relationships, policy setting forces of change, and structural developments in the grain-livestock subsector.

STRUCTURAL DEVELOPMENTS IN THE U.S. GRAINS SUBSECTOR

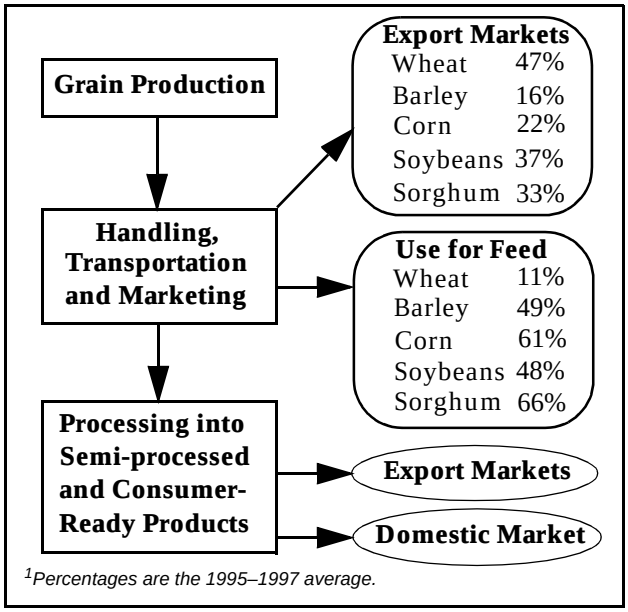
Gary Adams and Linda M. Young

INTRODUCTION

The purpose of this paper is to describe major changes in the structure of the U.S. grains sector and to assess how these structural changes will affect the sector's competitiveness. Part of this assessment involves evaluating the impact of integrating the grains sector of the United States with that of Canada and Mexico, as a result of the North American Free Trade Agreement (NAFTA). This paper focuses on wheat, barley, grain sorghum, corn and soybeans, the most important grains and oilseeds in the United States. Cash receipts for these five crops were $50 billion in 1997 and accounted for 25 percent of total farm receipts.

To assess changes in the industry it is necessary to understand its structure. Figure 1 illustrates the components of the industry and how they are linked. Bulk grains and oilseeds have three markets: export markets as primary undifferentiated products, domestic markets for further processing, and domestic feed markets. An efficient production sector alone does not ensure competitiveness as handling, transportation and marketing contribute heavily to the cost of grains. Semi-processed products include flour and oil used in the production of consumer-ready products for domestic or export markets.

Figure 1: Structure of U.S. Grains Sector[1]



[1]*Percentages are the 1995–1997 average.*

Given the complexity of evaluating markets for the major grains, only the most important changes will be discussed. Emphasis will be placed on evaluating the impact of changes on the ability of the U.S. grains sector to compete in both the domestic and world markets.

The first part of the paper includes an examination of recent trends in grain production. The following investigation into domestic commodity policy includes the impact on:

- supply response,
- stockholding and price variability, and
- acres retired from production under the Conservation Reserve Program (CRP).

The second part of the paper addresses changes in handling, marketing and processing including:

- the impact of NAFTA on trade flows and market integration,
- trends in food processing for grains and oilseed products, and
- implications of food and feed use of grains and oilseeds for U.S. markets.

GRAIN PRODUCTION

Trends in North American Grain Production

Wheat. U.S. wheat production was 68.7 million metric tons (mmt) in 1997, an increase of 17 percent since 1987 (see Table 1). Over the last decade wheat production increased by 54 percent in the Northern Plains, 15 percent in the Central Plains, and 28 percent in the Far West. Wheat production and yields decreased in the Corn Belt and Southern Plains. In all other regions of the U.S. wheat yields increased an average 7 percent since 1987.

The average increase in yield for the United States masks a wide variation in the realized yield of different classes of wheat. Hard red winter wheat yields declined between 1982 and 1995. Epplin (1997) investigated the impact of U.S. domestic farm programs on production of hard red winter wheat. While his empirical work was limited to Oklahoma, the results appear applicable to other states. Epplin found that domestic commodity programs provided incentives for increased grazing of winter wheat acres. Other changes in production practices, such as the variety selected and the planting date, optimized the sum of grazing and wheat production. However, these changes caused a downward trend in yield.

Table 1: Trends in U.S. Grain Production, 1997 Production (mmt) and Percentage Change from 1987

	Barley		Corn		Sorghum		Soybeans		Wheat	
	mmt	% chg	mmt	% chg	mmt	% chg	mmt	% chg	mmt	% chg
U.S.	**8.15**	***-7***	**237.90**	***33***	**16.59**	***2***	**74.20**	***35***	**68.77**	***17***
Corn Belt	0.00	*0*	116.70	*26*	1.40	*3*	41.50	*35*	6.41	*-11*
Central Plains	0.24	*-37*	42.90	*39*	8.64	*10*	6.30	*48*	18.26	*15*
Delta States	0.00	*0*	3.30	*251*	0.54	*14*	5.80	*12*	1.39	*-13*
Far West	2.85	*-10*	2.10	*23*	0.00	*0*			11.13	*28*
Lake States	0.71	*-24*	38.70	*44*	0.00	*0*	10.20	*57*	3.28	*5*
Northeast	0.27	*5*	6.10	*24*	0.00	*0*	1.10	*19*	1.07	*41*
Northern Plains	3.90	*2*	10.20	*61*	0.29	*21*	4.20	*104*	15.26	*54*
Southeast	0.18	*-4*	10.40	*16*	0.12	*17*	4.60	*-3*	3.61	*7*
Southern Plains	0.01	*-48*	7.40	*50*	5.61	*-10*	0.60	*15*	8.36	*-8*

Note: Percentage change calculated with the average of 1987-1989 and 1995-1997.
Source: See end note for region definitions.

Barley. U.S. barley production was 8.15 mmt in 1997, a decline of 7 percent since 1987. Production is concentrated in the Far West and Northern Plains regions, which over the last decade respectively decreased production by 10 percent and held steady. Barley production could not compete with production of wheat in the Far West. Barley yields increased an average of 25 percent in the Far West, while in the Northern Plains barley yields increased 37 percent. As provisions were introduced into commodity programs that allowed producers flexibility in their planting decisions, barley producers shifted into competing crops when possible. In the malting barley industry direct contracting between growers and brewers is common, and proprietary varieties are commonly used (Bushena, Gray and Severson, 1997).

Corn. U.S. corn production reached 238 mmt in 1997, an increase of one third in the last decade. Corn is largely produced in three regions – the Corn Belt, the Central Plains and the Lake States, which increased production by 26, 39 and 44 percent respectively. Yields increased throughout the United States, with yields in the Corn Belt increasing by 16 percent over the past ten years.

Sorghum. U.S. sorghum production was 17 mmt in 1997, showing almost no change in the level of production or yield in the last decade. Production occurs almost completely in the Central and Southern Plains, and no change across regions has been evident.

Soybeans. U.S. production of soybeans increased 35 percent in the last decade, reaching 74.2 mmt in 1997. Production in the Corn Belt, the major producing region, also rose 35 percent. Yields increased by 20 percent nationwide, with little variation for the major producing regions.

Value-Enhanced and Genetically Modified Grains. Value-enhanced grains and oilseeds include pest and herbicide resistant crops and end-use enhanced crops. Pest resistant crops include B_t corn and cotton. These crops have been genetically engineered to contain *Bacillus thuringiensis* which is toxic to many important pests of these crops. Herbicide resistant crops include Roundup ready soybeans which are resistant to the herbicides used on them. Herbicide and pest resistant crops reduce input requirements and increase yields. The importance of these crops is rapidly expanding, with 12-15 million acres estimated to be planted to herbicide–resistant soybeans (Harwood, 1997), accounting for around 18 percent of planted soybean acreage in 1997. It is expected that planted acreage of Roundup Ready soybeans will reach 60 percent in the next few years (Jacobson, 1998). These crops do not have to be kept separate in the grain handling system.

End-use enhanced crops include high oil and waxy corn. These crops have had a longer presence in U.S. agriculture and have had limited market penetration. One reason for the limited market penetration is that the identity of these products must be preserved in marketing, adding to their cost.

Total acreage planted to value-enhanced crops is estimated to be between 28-36 million acres (Harwood, 1997). U.S. cropland planted to the 15 major crops is around 300 million acres (FAPRI, 1997). This means that value-enhanced grains currently account for 9-12 percent of U.S. cropland. Issues of concern in developing the market for these crops includes labeling as genetically modified organisms, and acceptance by domestic and foreign consumers. B_t corn and Roundup ready soybeans have been approved for use in the European Union's market. The quick adoption of Roundup ready soybeans indicates that U.S. producers feel it will increase revenues, at least in the short-run. As it is expected that other exporting nations will also adopt these products, their adoption in the United States is not likely to increase U.S. competitiveness for a significant period of time.

Implications of Domestic Policies in the U.S. Grains Sector

Over the last several decades, U.S. grain production has been influenced by a variety of government programs. The objectives of the programs have included price and income stabilization for producers, resource conservation and environmental benefits, and increasing U.S. competitiveness. In many years, these programs were a substantial cost to the government. The mid-1980s represented the peak with annual outlays exceeding $20 billion in fiscal years 1986 and 1987. Since that time, changes in domestic policies within the United States have generally been designed to reduce government outlays for agriculture. Along with reduced payments, these changes have also been accompanied by fewer controls and restrictions on the decisions of producers.

A significant change in farm programs and their influence on acreage decisions followed passage of the Federal Agriculture Improvement and Reform (FAIR) Act of 1996. This legislation was designed to give producers the freedom to make planting decisions based on market signals rather than government programs. In the

years leading up to the FAIR Act, government programs played a substantial, yet declining role in determining acreage decisions in the United States. The programs that controlled acreage decisions for the 1982-95 crops were defined by stringent planting restrictions, and compliance with these restrictions determined eligibility for government payments. Producers were assigned a base acreage for the program crop that depended on recent cropping history. In most years, a percentage of this base was required to be idled, and the remainder had to be planted to the program crop. Meeting these requirements qualified the producer to receive a government payment, defined as the difference between the target price and the maximum of the average market price or the announced loan rate. As a result, the acreage decisions for feed grains, wheat, cotton, and rice were largely driven by policy variables and not market signals. Though the same program structure did not exist for soybeans, acreage decisions for this crop were also affected through competition for available area.

Beginning with the Food Security Act of 1985, modifications designed to increase market orientation were introduced, but the general structure of the programs remained intact. Legislation in 1990 increased the market orientation of acreage decisions by introducing Normal and Optional Flexible Acreage (NFA and OFA, respectively). The NFA represented 15 percent of a producer's base acreage that did not receive government payments and could be planted to a crop other than the program crop. The OFA was an additional 10 percent that could also be planted to another crop but doing so would forfeit program payments on those acres. The significance of the NFA lies in the fact that acreage decisions for this portion of the base were driven by market and not government incentives.

The 1996 FAIR Act removed the acreage controls found in the earlier programs, and introduced a new era with market signals driving acreage decisions. Payments divorced from production have now replaced deficiency payments as a means of income support. With a few exceptions for specialty crops, producers are now free to plant any crop without jeopardizing government payments. Annual acreage idling requirements were also eliminated under the FAIR Act.

Supply Response Under the FAIR Act

With the relaxation of acreage controls under the FAIR Act, questions concerning the supply response of U.S. grains and oilseeds include potential changes in regional acreage mixes and how acreage will respond to changes in market signals. Definitive answers to these and other questions may be elusive, but some conclusions can be drawn.

It is reasonable to assume that there will be a greater response to market signals under the FAIR Act than was observed under the previous period of acreage controls and target prices. During these periods, the response to market signals was distorted by policy planting restrictions. Historical price responses under the previous programs may be used as a proxy of a lower bound for acreage responsiveness under the FAIR Act.

Table 2 shows the elasticity estimates developed at the Food and Agricultural Policy Research Institute (FAPRI, 1997) for recent historical periods. Own- and cross-price elasticities are given for corn, wheat, and soybeans. The elasticities are derived from estimated models that incorporate the relevant policy parameters during the different periods. In general, responsiveness for the 1991-95 period was found to be larger than the previous two periods. This is not surprising given the increased market orientation of the 1990 legislation relative to the previous programs.

As mentioned earlier, the NFA provisions introduced with the Omnibus Budget Reconciliation Act (OBRA) of 1990 provide a glimpse of acreage decisions based on market signals. This program was in place in 1991-95, and data were published based on the crop planted on the flexible acreage. These data were aggregated into the major production regions, and the cross-section data were pooled with the time-series observations for estimation purposes (Willott, Adams, Young, and Womack, 1996). The amounts flexed into the different uses were estimated based on expected market returns. The resulting acreage elasticities are also given in the Table 2. As expected, the price elasticities are substantially larger than was estimated under the previous programs.

Table 2: U.S. Acreage Elasticities

	1982-1985	1986-1990	1991-1995	Flex
Corn Acreage				
Corn Price	0.219	0.207	0.235	0.670
Cotton Price	-0.032	-0.030	-0.026	-0.023
Sorghum Price	-0.004	-0.003	-0.002	-0.015
Soybean Price	-0.115	-0.099	-0.114	-0.350
Wheat Price	-0.025	-0.022	-0.024	-0.065
Wheat Acreage				
Wheat Price	0.339	0.336	0.410	1.025
Barley Price	-0.091	-0.080	-0.078	-0.105
Corn Price	-0.038	-0.030	-0.041	-0.104
Cotton Price	-0.029	-0.028	-0.029	-0.088
Sorghum Price	-0.078	-0.058	-0.067	-0.092
Soybean Price	-0.002	-0.002	-0.007	-0.100
Soybean Acreage				
Soybean Price	0.268	0.237	0.271	0.994
Barley Price			-0.002	-0.029
Corn Price	-0.182	-0.172	-0.230	-0.803
Cotton Price	-0.045	-0.044	-0.040	-0.021
Oats Price			-0.002	-0.016
Rice Price			-0.002	-0.020
Sorghum Price	-0.005	-0.004	-0.009	-0.075
Wheat Price	0.008	0.007	-0.007	-0.170

Source: FAPRI 1997.

As an illustration of the impact of the range in elasticities, assume corn acreage under a baseline set of prices is 80 million acres. If the corn price increases by 10 percent with all other prices constant, corn acreage would increase by 1.9 million acres using the 1991-95 elasticities and by 5.4 million acres using the flex elasticities. However, these estimates should be viewed with some caution. It would not be reasonable to assume that producer decisions regarding acreage under the FAIR Act would respond in the same way. There are likely to be agronomic factors and rotational considerations which will dampen the response to market signals.

The second issue deals with potential shifts in acreage mix as producers compare relative returns from the market. Under the previous legislation, returns from the program coupled with penalties for leaving the program to produce another crop played a large role in determining the acreage mix. Producers were reluctant to abandon the program to plant other crops since this reduced base acreage in subsequent years. In the absence of such restrictions, certain commodities will not be competitive on the basis of market returns. Table 3 shows the net returns above variable costs for selected commodities in a few of the major production regions of the U.S. Historical data for prices, yields and costs of production come from various USDA publications. Projections for the 1998-2000 period are based on projections from the FAPRI January 1998 baseline.

Table 3: Regional Returns Above Variable Costs of Production

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	(Dollars per Acre)										
Corn Belt											
Corn	133	110	157	134	181	222	179	152	147	147	156
Soybeans	140	121	151	162	163	174	199	189	158	165	167
Wheat	47	6	73	36	87	109	62	90	59	62	67
Central Plains											
Corn	157	118	108	91	131	152	162	122	114	115	124
Soybeans	95	82	140	132	145	117	197	166	135	140	143
Wheat	46	44	52	56	59	68	66	76	49	50	54
Sorghum	63	54	71	64	79	89	97	87	78	78	83
Northern Plains											
Soybeans	81	71	68	53	110	108	132	120	92	96	97
Wheat	28	46	63	70	55	83	58	26	37	39	42
Barley	45	44	52	36	39	70	58	35	34	35	39
Far West											
Wheat	56	91	93	98	112	175	156	110	94	98	106
Barley	53	64	46	54	32	93	62	56	43	45	50

Source: FAPRI 1998.

For the Corn Belt and Central Plains, corn and soybeans yield substantially higher returns than competing crops in those regions. In addition, soybean returns are $10-$15 higher than corn returns. Sorghum returns exceed wheat returns by an average of $20 per acre between 1990 and 2000 in the Central Plains. Barley and wheat are competitive with each other in the Northern Plains, but wheat returns substantially exceed barley returns in the Far West.

These relative returns suggest that the acreage mix will likely change under the FAIR Act. When compared to most other crops, corn and soybeans show a definite advantage. Over the last decade, there has been a modest west and northward shift in corn and soybean acreage. As new varieties become available that can better tolerate cooler and drier climates, the shift may become more pronounced. Certainly barley, and perhaps wheat, are likely to lose acreage to corn and soybeans.

Stockholding Under the FAIR Act

With the elimination of the Farmer-Owned Reserve (FOR) program, the FAIR Act officially removed the government from the stockholding business. From a practical standpoint, this is nothing new to the U.S. grains sector since the FOR had not been used since 1994. With marketing loans in place for the major crops, producers will not forfeit grain placed under loan to the government, assuring that there will be virtually no government stocks held in the coming years. With these changes, stockholding will now become the responsibility of the private sector. This has important implications for price volatility when there are unanticipated shocks to the market. With increased responsiveness to market forces, planted acreage will be more sensitive to price volatility.

The potential for increased variability in production, consumption, and prices has been examined by Ray, Richardson, De La Torre Ugarte, and Tiller (1998). In the study, the authors used the FAPRI November 1997 baseline to determine the projected supply, demand, and price of U.S. commodities. A stochastic analysis was conducted by introducing variability through random yield and export shocks for 100 iterations over the 1998-2006 period. The resulting variability from the multiple draws was compared to observed historical variabilities.

As reported by Ray et al., the means, standard deviations, and coefficients of variation for corn, soybeans, and wheat are given in Table 4. For all commodities, the variability, as indicated by the coefficient of variation, increases in the projection period relative to history. Across the three commodities, corn shows the greatest increase in price variability with the coefficient of variation increasing from 0.133 to 0.242. This suggests that corn prices will be 82 percent more variable over the projection period. To put it another way, over the simulation period, corn prices had a mean of $2.65 per bushel with a standard deviation of $0.64 per bushel. This compares to a mean of $2.34 per bushel and a standard deviation of $0.31 per bushel over the historical period 1986-96. Wheat prices were found to be 40 percent more variable than was observed in the historical period.

Table 4: Summary of Historical and Simulation Results for Crop Variables

	Corn		Wheat		Soybeans	
	1986-1996	1997-2006	1986-1996	1997-2006	1986-1996	1997-2006
Planted Acreage						
Mean (Million Acres)	74.1	82.3	71.5	69.6	60.3	68.0
Standard Deviation	3.9	7.7	3.8	6.2	1.4	6.2
Coefficient of Variation	0.053	0.094	0.053	0.089	0.023	0.091
Ending Stocks						
Mean (Million Bushels)	1,897	1,271	t735	683	265	310
Standard Deviation	877	684	276	192	72	147
Coefficient of Variation	0.462	0.538	0.375	0.281	0.270	0.473
Farm Price						
Mean ($/Bushel)	2.34	2.65	3.35	3.55	6.06	6.43
Standard Deviation	0.31	0.64	0.49	0.71	0.75	1.00
Coefficient of Variation	0.133	0.242	0.146	0.200	0.124	0.156

Source: Ray et al., 1998.

In the absence of planting restrictions under the FAIR Act, price variability is transmitted through to planted acreage. Variability increases for the planted acreage of all three crops. The greatest increase is found in soybeans, where acreage variability rises by 296 percent from the historical period. Corn and wheat acreage variability increase by 77 and 68 percent, respectively.

The authors are quick to note that it is difficult to determine how much of the increased variability can be attributed directly to the 1996 farm bill. Reduced stock levels are most likely the greatest factor, and they were already low before the FAIR Act was in place. There is historical evidence that stocks dampen price volatility. In 1988, the U.S. corn crop fell to 4.9 billion bushels, yet the season average corn price rose to the relatively modest level of $2.54 per bushel. The shortfall in production was offset by beginning stocks of 4 billion bushels. In 1990, a study by FAPRI looked at the implications of the 1988 drought in the absence of such large stock holdings. Assuming a beginning stock level of approximately 2 billion bushels, season average corn prices rose to $3.59 per bushel in 1988, a 41 percent increase above the observed level of $2.54.

The current environment of reduced stocks suggests that there is more upside potential in prices when a shortfall in production occurs. This in fact occurred in the latter part of 1995 and the first few months of 1996. Increased price and production variability has important implications for producers, distributors, and end users of U.S. grains and oilseeds. The U.S. grains sector is on a year-to-year basis in terms of production and consumption. Shortfalls in production cannot be met by grain reserves, and price will be used to ration demand to meet the available production.

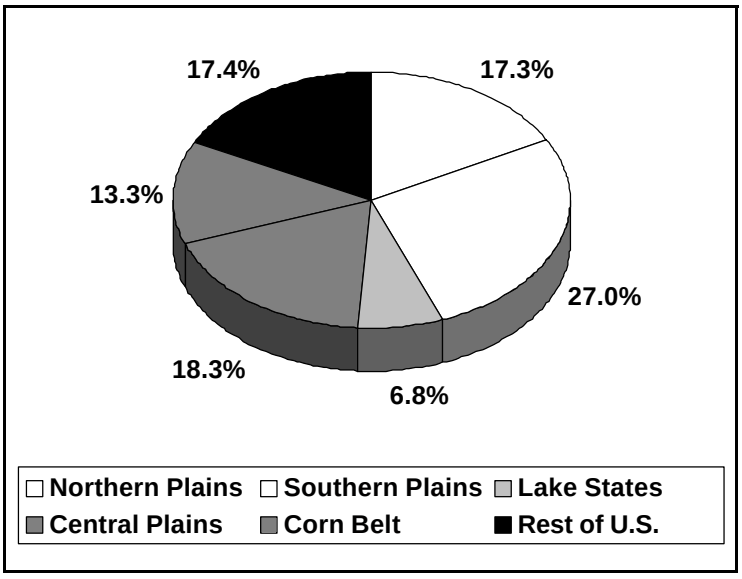
With a higher elasticity of demand, U.S. export quantities will absorb more of the shortfall than the domestic uses. Importers of U.S. corn are the most at risk since there are relatively few reliable exporters in world markets. Importers of soybeans will be somewhat less susceptible because of the export presence of Brazil and Argentina. In the wheat market, there are a number of other suppliers that stand ready to meet the import demand.

The increased price volatility associated with the current environment should also be reflected in the options markets through higher premiums. The premium of an option is the sum of its intrinsic value and time value. A number of factors influence the time value of the option, one of which being the underlying volatility of the market or futures prices. As price volatility increases, the range of possible prices also increases. Hence, option writers require larger premiums to cover the potential losses that might occur.

The Conservation Reserve Program

Long-term acreage idling under the FAIR Act was maintained through a number of programs designed to provide environmental benefits. The most prominent of these is the highly-popular Conservation Reserve Program (CRP). The FAIR Act authorized the continued use of CRP with much of the operation left to the discretion of the Secretary. A cap of 36.4 million acres is in place from now through 2002. Recent signups suggest that the CRP will remain at relatively large levels in coming years. In 1997, two signups were held to replace the 21.4 million acres that expired in October of that year. As a result of recent signups, the CRP will total 29.9 million acres on October 1, 1998.

Figure 2: Distribution of CRP Acreage, 1998



The USDA has indicated that future enrollments will push total acreage towards the legislated maximum. At that level, CRP will affect U.S. and regional crop production. The greatest impact will likely be on wheat production since a majority of CRP acres are located in the Plains. Recent signups have increased the concentration in the Plains states. In 1993, the Plains states accounted for 57 percent of enrolled acreage. By October 1998, that percentage will have risen to 63 percent (Figure 2). While the trade-off between CRP and planted acreage is not one-for-one, enrollment at this level reduces acreage and production below what they would have been in the absence of the program.

Implications for U.S. Grain Production

Relaxed acreage controls and increased reliance on market signals are likely to accentuate recent production trends. Over the last decade, corn and soybean production has increased in the traditional production regions and expanded into new areas of the United States. This is consistent with relative returns in the different regions. As U.S. producers adjust to increased flexibility under the FAIR Act, the cost advantages in the different regions will become more important. In the past, it was sufficient to maintain variable production costs below the target price. Now, producers must give greater consideration to where they stand relative to the market price. The FAIR Act also gives producers the ability to better take advantage of certain market opportunities. In 1997, U.S. soybean acreage increased by 10 percent in response to strong market signals. Fewer acres were planted to winter wheat in the fall of 1997, and it is anticipated that those acres will be planted to corn and soybeans in the spring of 1998. Such a response would have not been possible under previous acreage controls.

THE U.S. GRAINS HANDLING, MARKETING AND PROCESSING SECTOR

NAFTA

Trade has increased since the reduction of trade barriers between Canada, the United States and Mexico. However, changes in trade flows are only one consequence of the integration of the grains sectors of these three countries.

Trade Flows. Trade has increased between Canada and the U.S., and between the U.S. and Mexico over the past ten years (see Table 5). In 1987, the U.S. had a negative trade balance for grains and feeds of 1.1 mmt with Canada. By 1996, the net trade deficit for grains and feeds increased to 3.4 mmt. For oilseeds, over the last ten years the United States switched from being a net exporter to Canada of .5 mmt of oilseeds and products, to being a net importer of 1.1 mmt. This is largely due to an increase in imports of canola oil. However, new crushing facilities in the United States are expected to reduce imports of canola and canola oil (USDA, ERS, 1997). In 1996 the United States produced 62 mmt of wheat, 236 mmt of corn, and 65 mmt of soybeans. While U.S. imports of these commodities have increased, import levels are still small compared to the size of the U.S. market, and are not a major factor in price determination.

Table 5: U.S. Trade with Canada and Mexico, 1987 and 1996 (mt)

	1987		1996	
	US to CA	**CA to US**	**US to CA**	**CA to US**
Wheat and Flour	2,286	311,251	22,193	1,284,516
Barley	1,460	200,103	NA	788,937
Corn	181,501	NA	875,044	333,515
Grains and Feeds	606,707	1,722,996	2,206,739	5,597,080
Oilseeds and Products	1,020,547	458,085	1,157,911	2,232,331
	US to ME	**ME to US**	**US to ME**	**ME to US**
Wheat and Flour	113,860	NA	1,616,205	NA
Barley	NA	NA	269,610	NA
Corn	3,333,022		6,314,387	2,774
Grains and Feeds	4,213,725	16,004	11,291,304	114,501
Oilseeds and Products	1,407,430	36,199	3,432,808	39,446

Source: Foreign Agricultural Trade of the U.S.

The United States is a net exporter of grains and oilseed products to Mexico. Exports of corn have doubled since 1987, reaching 6.3 mmt in 1996. United States exports of grains and feeds increased by 266 percent, and oilseeds by 247 percent since 1987. Mexico accounted for 5 percent of U.S. wheat exports, and 13 percent of U.S. corn exports in 1996.

U.S. exports of sorghum to Mexico declined to 1.97 mmt in 1996, from a high of 4.9 mmt in 1992. This decline is attributed to increased Mexican sorghum production as their support prices for corn have been reduced.

Impact of NAFTA. While trade flows have increased, a recent report by the USDA/ Economic Research Service (1997) shows that only a small part of the increase, usually between 3 and 10 percent, is due to trade reform with the implementation of the Canada-U.S. Free Trade Agreement (CFTA) and NAFTA. NAFTA had the greatest impact on U.S. exports of vegetable oils to Canada and Mexico and U.S. exports of corn to Mexico. This empirical analysis can only take into account the changes in tariffs and non-tariff barriers that have occurred with NAFTA. It does not include the pivotal role that securing passage of NAFTA played in policy reforms in Mexico that enhanced trade, nor does it account for the role that NAFTA played in preventing the implementation of protectionist policies with the severe devaluation of the Mexican peso.

Integration of the U.S. and Canadian Grain Handling and Processing Sectors

Integration of the U.S. and Canadian grain handling, processing and milling sectors is occurring due to substantial investments made by U.S. multinational companies in Canada. U.S. companies have invested heavily in the Canadian malting industry (Bushena, Gray and Severson 1998), with purchases by Archer Daniels Midland (ADM)

of Dominion Malting in 1990, Cargill and Ladish entering a joint venture in 1991, and ConAgra acquiring 70 percent of Canada Malt in 1996. Between 1994–1996, ADM purchased around 51 percent of total Canadian milling capacity (Weisensel, Milling and Baking News). Investments have been made or announced in high volume terminals by ConAgra, Cargill and Louis Dreyfuss, and by ADM in process elevators. Cargill intends to build a terminal facility on the west coast with the Alberta Wheat Pool, and has long-standing investments in the canola industry. Finally, ADM bought 40 percent of ownership of United Grain Growers.

Several factors have contributed to this investment. With the implementation of CFTA in 1989, investors were granted 'national treatment'. This means that U.S. investors must be treated the same as Canadian investors in Canada, and vice-versa. NAFTA retained and built on these provisions by expanding the coverage from direct foreign investments to a wide variety of investments. NAFTA also deepened investment security by improving dispute settlement procedures (Globerman and Walker, 1993).

While CFTA created a favorable investment climate for U.S. companies, the impetus for investment was provided by Canadian government policy changes, including the removal of the Western Grain Transportation Act and the reduction of government involvement and regulation of the rail industry. Companies are also seeking to position themselves in the event that the Canadian Wheat Board loses its monopoly right to export wheat and barley.

Bushena, Gray and Severson (1998) argue that cost reductions in the malting barley industry are possible due to the mergers that have occurred. They cite the ability of companies to source their supply and to direct output over a wider base, to reduce transportation costs, to reallocate production across plants, and to exploit economies of scale as factors that may contribute to cost savings. They estimate that malt production will increase in Canada and decrease in the United States, that barley producers' surplus will increase a little, and that malting firms surplus will increase nearly 25 percent due to the combination of free trade and firm mergers.

Investments in grain handling have been made as part of the move towards larger and more efficient primary and transfer terminals. Variable costs may be reduced in new facilities due to investment in larger and more efficient terminals**.** In addition, the ability of companies to source their grain was given as one motivation for their investments**.** Investments by ConAgra in the Canadian milling industry allow it to source Canadian grain of a particular quality for its clients in the U.S.

Investment by U.S. companies in Mexico's grains sector is occurring, but to a lesser extent than in Canada. Two joint ventures were reported between U.S. and Mexican firms in 1997 (Milling and Baking News). Investment by U.S. companies accounts for 65 percent of foreign direct investment in Mexico's agriculture. Most U.S. investment is occurring in the vegetable and flower industries, and only a small proportion of total investments has occurred in the grains industry (Ávila and López López 1998).

Investments by U.S. companies in the Canadian industry and mergers between U.S. and Canadian firms indicate that integration is occurring between the grain sectors of the two countries. Competitiveness is a concept about the ability of national sectors to compete. This concept is now undermined by the rise of multinational companies, whose management and profit goals are not limited by national boundaries. Eventually, further integration of the industry may necessitate a concept of competitiveness based on the performance of the industries in both countries.

Possible Elimination of the Canadian Wheat Board's Export Monopoly

Since the CFTA there has been increased pressure to reform the Canadian Wheat Board (CWB). The CWB has the monopoly right to export Canadian wheat and barley to the United States and other destinations on terms decided by the Board. The status of the CWB is the subject of great controversy in Canada and has figured prominently in two forms of producer votes, recent court cases and a federal investigation. This debate was initiated by Canadian producers wanting choice in marketing wheat and barley including free access to the U.S. market. The Wheat Board has also been a source of friction in trade relations with the United States, making increased discipline of state trading enterprises a U.S. priority in the next round of multilateral trade negotiations under the World Trade Organization. Part of the tension is due to the increase in the level of exports and part is due to differences in the U.S. and Canadian grain marketing systems.

Unfortunately, empirical analyses focused on barley have reached different conclusions on the impact of removing the CWB. Schmitz, Gray, Schmitz and Storey (1997) estimate that export sales of feed barley by Canada will decrease by an average of .5 mmt, and that Canadian feed barley consumption will, on average, slightly increase.

Both Carter (1993) and Johnson and Wilson (1995) conclude that exports of feed barley from Canada to the United States will increase if the authority of the CWB to control exports is removed. Their estimates of barley exports to the U.S. range from 0.5 to 2.7 mmt.

While the lack of consistent empirical findings is unfortunate, the size of the impact of removing CWB single desk seller status must be kept in mind. For the U.S. industry, the impact on prices of imports of feed wheat and barley between 0.5 to 3 mmt would be extremely small, as it is a fraction of the total 1996-97 U.S. production of feed grains of 267 mmt.

No public empirical studies have evaluated the impact of removing the Canadian Wheat Board on exports of wheat from Canada to the United States. One reason that Canadian producers wish to export to the U.S. market is the difference between prevailing prices in the U.S. spot market and the annual pooled price of wheat offered by the CWB. With the elimination of CWB pooling, this incentive would also be removed.

Alston, Gray and Sumner (1994) investigated the impact of Canadian wheat exports on the U.S. market using a simulation model of the U.S., Canadian and world markets for durum, milling and feed wheat. They analyze the impact of reducing U.S. imports of Canadian milling wheat from 2.5 to 1.25 mmt, and estimate that an increase of one-half cent a bushel results.

Technically speaking, Alston, Gray and Sumner's results should not be used to evaluate much larger U.S. imports. However, their results suggest that flows of wheat to the U.S. market in the magnitude of 2-3 mmt will decrease prices by one to two cents a bushel.

Implications of Integration. The main consequences of NAFTA for grains and oilseeds may be within the industries which now consider the three countries to be a single market. While open borders increase the options available to industry, it limits the choices open to policymakers who wish to achieve domestic policy objectives. For Canada, the cost of continuing the CWB's single desk seller status appears to be trade friction with the United States and dissatisfaction on the part of Canadian farmers who want open access to the U.S. market. For the United States, careful attention must be paid to the consequences of using export subsidies and land retirement programs. To the extent that these programs reduce the supply of grains on the U.S. domestic market, they create an incentive for Canadian exports to the United States.

The Seed Market for Grains and Oilseeds

Significant changes are occurring in the products offered by, and the structure of, the seed industry. As discussed in the section on trends in U.S. production, value-enhanced crops already account for 9-12 percent of U.S. cropland. Many new genetically engineered products are likely to be introduced in the near future, including crops that are resistant to drought, cold, herbicides or that contain other characteristics such as higher protein content.

The development of these products is occurring largely in the private sector, concurrent with a structural change in the seed industry. Previously, seed companies bought varieties developed by public institutions, and these companies multiplied and marketed the seeds. The market was characterized by many small firms (Cook, 1994). Currently, new products are being developed by a few companies, such as Pioneer Hi-Bred, or Monsanto, who have made significant investments in research and development of genetically engineered crops. As these products are demanded by producers, it is likely that the trend of industry concentration will continue. In some cases, issues of potential market power may be important. For example, Monsanto recently acquired AgriPro wheat germplasm, giving them the entire market for wheat hybrids (Engelke, 1997).

The Market for Processed Foods Derived from Grains and Oilseeds

Value is added in the food sector through the activities of primary production, processing, transportation, wholesale and retail trade, and food service. The value added through food processing is greater than that of primary production, and in

1994, food processing accounted for 25 percent of the total value added in the U.S. food sector. In the same year, the total value of food and kindred products (defined as products that have undergone some processing), was $430 billion dollars (Sheldon, 1998), with products from grains and oilseeds accounting for $96 billion.

Processed foods exceed the value of primary products in the international market place as well. In 1993 trade in processed food and beverages was twice the value of trade in agricultural products and commodities, and the relative importance of processed food and beverage trade is expected to continue to increase (Henderson, Handy and Neff, 1996).

Exports of products derived from grains and oilseeds increased from $3.7 to $6.9 billion between 1989 and 1997. In 1995, exports accounted for 18 percent of the value of U.S. production of soybean oil, 19 percent of wet corn milling, and 60 percent of 'other' vegetable oils. For most other grains and oilseed products, exports of processed products play a much smaller role, accounting for 1 to 6 percent of value of domestic shipments.

Economists have noted that the United States has not kept pace with other developed nations in the expanding global market for processed foods.

> In the United States, however, processed food exports account for approximately 40 percent of total food trade as compared to an average of 75 percent for leading European exporters. Why does the U.S. export relatively less processed food as a share of total food and agricultural exports than other developed countries?...Without a debate over what "competitiveness" means, alternately it could be argued that the United State's competitive advantage, and hence its "competitiveness" lies in producing and exporting bulk commodities rather than processed food products…Most large food manufacturers rely much more on investing in overseas markets than they do on exporting…By 1995, sales from these (U.S.) foreign affiliates had grown by 189 percent since 1982 and were estimated to be at $113 billion, almost four times U.S. processed food exports of $29.39 billion in 1995. (Sheldon, 1998, pp. 65-66).

Many U.S. multinational firms use foreign direct investment instead of direct exports as a way to penetrate foreign markets. Economists have advanced a number of explanations for this including:

- exploiting a management advantage when located within the market;
- acquiring precise behaviour on consumer preferences; and
- exploiting economies of scale when the market is large (Reed, 1996).

However, these explanations do not address why foreign direct investment is used more by U.S. firms than firms in other developed nations.

The consequences of increased exports of processed food from the United States include an increase in the demand for agricultural inputs and the processing activity, which may or may not be profitable. The consequences of foreign direct investment in food processing are not straightforward, but are not as positive for the agricultural sector as direct exports. Some key ingredients may come from the U.S., but others may come from local markets (Sheldon). Connor and Schiek (1997) question if the exports would have occurred without the existence of the foreign affiliate.

The domestic and export market for processed foods are clearly of growing importance for U.S. grains and oilseeds. However, the importance of foreign direct investment as a strategy used by U.S. firms makes conclusions about the competitiveness of the U.S. sector difficult. Data on imports and exports, and on the resulting net trade balance, do not tell the whole story.

Relationship Between Food and Feed Uses of U.S. Grains and Oilseeds

U.S. grains and oilseeds provide a basic input into the production of meat and grain based products destined for both the domestic and international markets. There have been changes in the relative importance of food versus feed uses and domestic consumption versus exports. Changes in the structure and growth of end-use industries have important implications for the grain and oilseed sectors.

Food and industrial uses of grains have grown steadily in recent years. For wheat, food usage continues to be the major domestic disappearance category. Since 1987, U.S. per person annual consumption increased an average of 1.4 percent. Over that same period, feed use and exports of wheat showed no or little growth. For corn, food and industrial uses represented a surging demand during the 1980s, increasing from 13 to 23 percent of total domestic disappearance over the decade. The emergence of the high-fructose corn syrup and ethanol industries is a primary driver of growth. Since 1990, growth in these industries has slowed and their shares of total consumption has stabilized. Future expansion in those industries depends on both market forces and policy developments. The ethanol industry relies on federal excise tax exemptions and tax benefits in some states. Ethanol production recently demonstrated a high degree of sensitivity to increases in the corn price. In 1995 and 1996, when corn prices showed substantial upward movement, corn used for ethanol showed the largest percentage decline of any of the demand categories.

While food usage represents a steadily growing demand for grains and oilseeds, the primary use of these commodities is the production of livestock. Over the past ten years, 63 percent of U.S. corn and around 50 percent of soybean production has been used in the domestic livestock industry. Changes and growth in the U.S. livestock industry are critical in determining the future of the grain and oilseed sectors.

While the U.S. livestock sector as a whole has experienced growth, different sectors have diverged in recent years. The biggest growth area has been and continues to be the poultry industry, led by broilers. Since 1987, broiler production has grown an average of 6 percent a year. At the same time pork and beef production

increased an average of 1.9 and 0.8 percent, respectively. Fueled by strong growth, broilers recently surpassed beef in terms of total production. With broilers and pork representing the strongest growth areas, feed demands are changing. On the positive side, these sectors are much more dependent on a corn-soybean meal ration than beef. However, broiler and pork production are more efficient in terms of pounds of feed necessary for a pound of meat than beef production. In a recent study, White (1997) assumed 1.9 pounds of feed were necessary to produce one pound of broilers, compared to 3.2 pounds of feed for a pound of pork (both on a live weight basis).

The sources of demand for the livestock sector also have implications for the grains sector. Recent domestic demand for the three major meats has been mixed. Over the last decade, per person beef consumption has declined by an annual rate of 1.1 percent and pork has declined by 0.1 percent. In stark contrast, U.S. per person broiler consumption has grown an average of 2.6 percent per year. The export markets for all three commodities have shown substantial growth in recent years. Since 1987, combined exports of beef, pork, and broilers have increased 434 percent. Currently, 8 percent of beef and 17 percent of broiler production are exported. Assuming feed conversion ratios for the different livestock categories, White (1997) estimated that approximately 300 million bushels of corn and 100 million bushels of soybeans are exported as meat. Applying White's methodology to U.S. meat export projections by FAPRI suggests that the amount of corn exported as meat will grow to 450 million bushels by 2006.

U.S. meat exports have benefitted from robust growth in global meat demand. Developing economies have experienced several years of strong income growth which has translated into additional meat in their diets. Most projections suggest that the global growth in meat consumption will continue. For the grain and oilseed sectors, where additional meat is produced becomes important.

Currently, only 10 percent of world broiler and beef production is traded. For pork, just 3 percent of world production is traded. While global meat trade is projected to expand, it will still remain relatively small in comparison to total production. Hayes (1998) argues that the cost of transporting meat from the interior of the United States to Asian markets is as little as $0.14 per pound. A pound of boneless-boxed pork or beef contains 8 to 16 pounds of grain, which costs $0.06 per pound to transport to Asian producers. Hayes concludes that the cost of transportation implies that the U.S. may export meat, not grain, to meet growing Asian demand.

CONCLUSIONS

Evidence presented in this analysis suggests that the production of corn and soybeans is likely to increase, both within the areas that have historically produced them and in the Northern Plains. The increase in production will be driven by higher relative returns as producers now have the flexibility to respond to changes in the net returns between crops. Forecasts of greater returns for corn and soybeans are par-

tially due to anticipation of continued increases in exports of meat and feed. A shift in the U.S. crop mix towards soybeans means that interactions in the domestic and international market with canola will become increasingly important.

The production of wheat is expected to remain relatively flat and to shift to the Northern Plains. Domestic consumption of grain products has increased on a per person basis and further growth will be largely due to population growth. Exports are expected to grow slowly due to moderate anticipated growth in world markets, and continued competition from Canada, Australia and the European Union.

End-use enhanced crops and malting barley are grown on contract with companies. In addition, some wheat and other grains may be grown on contract in order to meet the quality attributes required by the buyer. However, unlike the hog, broilers, fruits and vegetable industries the extent of vertical integration in the grains sector is limited. When it becomes more pervasive there may be consequences for price discovery and for producer welfare.

For the production sector, cost minimization is the essential strategy for competing in the production of grains, when they are produced as a primary undifferentiated product (Bedahl, Abbott and Reed, 1994). The United States has a long history of investment in research by the public sector to achieve that goal. It is well documented that many production technologies will cross national boundaries (Alston, Norton and Pardy, 1995). This means that in many cases it will be more difficult to justify government involvement in research on the basis that it will confer a national advantage to its producers over the long run. Certainly technology developed by the private sector may be actively transferred to other countries where market opportunities exist. The mobility of technology makes investment in human capital and infrastructure increasingly important components of cost minimization strategies.

Integration of the grains and oilseeds sectors within North America is occurring, particularly in the United States and Canada. Investments by multinational companies, primarily U.S. multinationals in the Canadian grain handling, processing and milling industries is occurring in response to business opportunities created by policy reform in Canada. To the extent that these companies can operate within a single North American market they should also be able to reduce costs through increased specialization and flexibility in their sourcing and marketing decisions. However, the importance of multinational companies makes it difficult to assess the national competitiveness of these industry sectors, as the net trade balance maintained by a country will not be a reliable indicator.

The presence of multinational companies in the food processing industry has similar ramifications on U.S. competitiveness. U.S. food processing firms have followed a strategy of direct foreign investment in the food processing industries located in other countries, again making it difficult to assess the competitiveness of the sector. The impact of foreign direct investment on the part of U.S. food processing firms on the grains and oilseeds sector are difficult to evaluate.

Price volatility is expected to increase due to policy changes under the FAIR Act. For the three commodities examined, the increase in price volatility was estimated to be substantial, with an increases of price volatility of 82, 40 and 25 percent for corn, wheat and soybeans, respectively. One consequence of increased volatility is that the price peaks could attract additional imports of wheat from Canada.

The future of U.S. farm commodity policy and policy responses to increased price volatility are important policy questions. The existence of relatively open borders, and U.S. commitments under the Uruguay Round Agreement, place real constraints on the options available to U.S. policymakers. Rodrik (1997) argues that global integration is occurring rapidly with negative consequences for social cohesion. This integration is occurring at the same time that the government provision of safety nets has been drastically reduced. Rodrik fears that the combination of increased integration and lack of broad (not sector-specific) government programs to address the needs of the losers from integration will lead to a backlash against trade, and ultimately to protectionist policies that are welfare-reducing. The scope of Rodrik's analysis is trade in general, however, it is applicable to agriculture. The U.S. grains sector is facing global integration without the buffer previously provided by government commodity programs. Rodrik's prescription is that economists should not minimize the negative consequences of global integration but should seriously consider the impacts and become active participants in the design of appropriate safety nets. His prescription seems appropriate for this forum.

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END NOTES

1. U.S. crop regions used throughout the paper are as follows:

Corn Belt:	*Illinois, Indiana, Missouri, Ohio*
Central Plains:	*Colorado, Kansas, Nebraska*
Delta States:	*Arkansas, Louisiana, Mississippi*
Far West:	*Arizona, California, Idaho, Nevada, Oregon, Utah, Washington*
Lake States:	*Michigan, Minnesota, Wisconsin*
Northeast:	*Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia*
Northern Plains:	*Montana, North Dakota, South Dakota, Wyoming*
Southeast:	*Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia*
Southern Plains:	*New Mexico, Oklahoma, Texas*

STRUCTURAL DEVELOPMENTS IN THE CANADIAN GRAINS AND OILSEEDS SECTOR

Kurt Klein and Gary Storey

INTRODUCTION

The Canadian grains and oilseeds sector has undergone a large number of significant changes over the last 25 years. Crop farms have become larger in most parts of the country and use larger machines with less labour. Farming practices have evolved to incorporate modern technologies including less tillage, more selective herbicides, and, increasingly, seeds that have been manipulated genetically for resistance to specific diseases or chemicals. In Western Canada, producers have been adjusting their farming operations and cropping patterns to respond to massive changes in the grain transportation and handling system brought on by the forces of globalization and deregulation. In Central Canada, crop producers have responded to increased demands for feed grains and supplements from their growing livestock sectors by planting much more barley and corn in Quebec and soybeans in Ontario. They are even growing canola in Ontario on a regular basis. In the eastern provinces, producers have decreased their oats area in favour of barley, with steady areas of corn in Nova Scotia and soybeans in Prince Edward Island.

Although new trading rules established under the Canada-United States Trade Agreement (CUSTA) in 1989, the North American Free Trade Agreement (NAFTA) in 1994 and the World Trade Organization (WTO) in 1995 have spurred the pace of change in the Canadian grains and oilseeds sector, they have not been the only factors involved. The sector was ripe for massive structural change following decades of government assistance and regulation. As federal and provincial governments began to unravel the web of assistance programs and make key changes to the way regulatory bodies operated, producers responded by changing their cropping programs and resource usage. These factors, together with rapid technological changes and opportunities for off-farm employment, have radically altered the structure of the Canadian grains and oilseeds sector.

This paper examines the extent and the causes of the structural changes in the Canadian grains and oilseeds sector over the last 25 years. It begins with a brief description of changes in land use, export markets and production technologies. The structural changes have occurred from producers responding to developments in agricultural research, price signals, agricultural and transportation policies, international trade agreements, off-farm employment opportunities, and institutions. Each of these forces of change are reviewed in the following sections.

STRUCTURAL CHANGES

A modern definition of industrial structure was provided by McFetridge (1986), who stated that the most important elements of an industry's structure answer the following questions:

- What is produced and in what proportion?
- Where is the output produced and what is its geographical distribution?
- What is traded and with whom? and
- How is the output produced?

Descriptive answers to these questions are provided below.

Land Use

The number of farms in Canada has continued to decrease. The 276,548 farms in Canada in 1996 (Table 1) are just over one-third of the number of recorded farms in 1951 (Statistics Canada 1997). The largest percentage loss in number of farms over this time has been in the Atlantic provinces and Quebec. Traditionally, these have been the provinces with the lowest farm incomes and smallest farms. In Western Canada, the loss in farm numbers has not been as great. In Alberta and British Columbia farm numbers actually have increased during the last decade.

There were 45.5 million hectares (ha.) in crops, improved pasture and summerfallow in Canada in 1996 (Statistics Canada, 1997). Of this, 34.9 million ha. were planted to crops, 4.3 million ha. were improved pasture and 6.2 million ha. were summerfallow. Manitoba, Saskatchewan and Alberta account for 38.4 million ha. (84 percent) of the total improved land area in Canada; Quebec and Ontario for 5.8 million ha. (13 percent); Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick for about one percent; and British Columbia for just under two percent.

The average farm size, as measured by land area, ranges from 59 ha. in Newfoundland to 466 ha. in Saskatchewan (Table 1). The farm sizes generally reflect the main types of farming in the different regions of the country. The largest farms are on the Prairies which is the major grain growing region of the country. Farms in all provinces except British Columbia have increased in size over the past twenty years.

Bollman et al. (1995) noted that the overall decline in farm numbers during the last 15 years was a result of decreases in the number of small farms. They found that the number of larger size farms with gross incomes of $100,000 or more actually has been increasing, particularly in Western Canada.

Table 1: Summary Statistics on Canadian Land Area and Farms, 1996

Province	Improved Land (thousand ha.)	Number of Farms	Ave. Farm Size (ha.)	Ratio of Farm Size (1996/1976)
Newfoundland	10	742	59.1	1.60
Prince Edward Island	183	2,217	119.6	1.49
Nova Scotia	138	4,453	96.0	1.06
New Brunswick	155	3,405	113.4	1.11
Quebec	1,945	35,991	96.0	1.24
Ontario	3,913	67,620	83.1	1.18
Manitoba	5,379	24,383	317.1	1.32
Saskatchewan	20,063	56,995	466.2	1.25
Alberta	12,897	59,007	356.3	1.08
British Columbia	844	21,835	115.8	0.92
Canada	45,529	276,548	246.1	1.22

Source: Canada Grains Council, Statistical Handbook 1996.

Probably the most significant change to have emerged in cropping patterns has been the development of the canola sector. In the last 20 years, canola has more than tripled in area, increasing its share of land use from 4.8 to 14.0 percent (Table 2). The value of canola production has surpasssed barley and now rivals wheat on the Prairies.

The other major change in cropping patterns on the Prairies has been the diversification into specialty crops such as mustard seed, lentils, canary seed, dry peas, potatoes, and niche crops like herbs, spices and berries. Although the area devoted to these crops is not large, the total world market is also not large. Canada has a significant market share in some of these crops.

Corn and soybeans are grown mostly in Central Canada. The area of both has increased, mostly at the expense of oats and mixed grains. Technology has contributed to this development as new varieties have allowed corn to spread north through Ontario into Quebec. The same has been true for soybeans where area devoted to this crop has increased by five times over the past 20 years.

Table 2: Area Under Crops in Canada, 1973-76, 1983-86 and 1993-96

Crop	Area in Hectares			Percentage of Total Crop		
	1973-76	1983-86	1993-96	1973-76	1983-86	1993-96
Wheat (ex durum)	8,561.8	12,035.4	9,676.7	32.3	38.3	29.1
Durum	1,249.4	1,670.3	1,977.9	4.7	5.3	5.9
Oats	2,521.0	1,376.2	1,429.5	9.5	4.4	4.3
Barley	4,605.3	4,625.2	4,376.0	17.3	14.8	13.2
Rye	299.1	368.8	167.7	1.1	1.2	2.0
Flaxseed	516.1	661.4	665.2	1.9	2.1	2.0
Canola	1,288.1	2,717.3	4,648.3	4.8	8.7	14.0
Corn	620.7	864.5	1,000.3	2.3	2.8	3.0
Soybeans	167.2	396.5	805.9	0.6	1.3	2.4
Mixed Grains	732.6	477.2	233.0	2.8	1.5	0.7
Specialty	240.0	432.8	1,498.8	0.9	1.4	4.5
Tame Hay	5,368.0	5,361.6	6,610.4	20.2	17.1	19.9
Fodder Corn	419.2	340.9	168.8	1.6	1.1	0.5
Summerfallow	10,945.5	8,406.3	6,755.7	29.2	21.2	16.9
Total Arable	37,502.3	39,734.3	40,014.2	100.0	100.0	100.0

Source: Canada Grains Council, Statistical Handbook. Various Years.

One measure of diversification is the Herfindahl Index[1]. This index declines when more crops are grown and each has a relatively smaller share of the total. It is clear that diversification of crop production has been increasing over the last 22 years in all regions of Canada except in Eastern Canada and British Columbia (Table 3). Most of the diversification has taken place in the Prairies where the index has fallen by six points during the last 20 years. The index has remained fairly constant in Central Canada (Quebec and Ontario) but has risen in Eastern Canada and British Columbia where tame hay has replaced much of the crop area.

[1]The Herfindahl Index is $H = \sum S_i^2$. where S_i is the share of the i^{th} unit. Each unit represents one crop: durum wheat, other wheat, oats, barley, rye, canola, flax, corn, soybeans, specialty crops, fodder corn, tame hay, summerfallow.

Table 3: Diversification of the Canadian Crops Sector, Measured by the Herfindahl Index

Date	British Columbia	Prairie Provinces	Central Canada	Eastern Canada	Canada
1975	41.0	21.6	26.6	41.7	17.5
1985	33.2	19.4	23.4	41.0	17.2
1995	46.0	15.8	23.8	43.8	14.2
1997	58.1	15.6	25.0	45.8	13.9

Source: Estimated from Canada Grains Council, Statistical Handbook. Various years.

Trade

The composition of trade in Canadian grains and oilseeds has changed significantly over the last 20 years. Both external and internal factors have contributed to the changes in trade patterns. Changes in political regimes (especially in the former Soviet Union and Eastern Europe), as well as in trade policies and programs in the United States and European Union, have been major factors. Changes in the relative profitability of the various crops as a result of technical developments and changed trade patterns have contributed to changes in Canada's export composition.

The Canadian grains and oilseeds sector is very dependent on trade. As a percentage of production, exports in the 1993-96 period were: 70 percent of common wheat, 82 percent of durum, 22 percent of barley, 38 percent of oats, 83 percent of flaxseed, 52 percent of canola and 25 percent of soybeans. In 1973-76, Canada was a net importer of soybeans but by 1993-96 Canada had become a net exporter of nearly a half million tonnes per year. Canada's annual net deficit in corn has shrunk from 750,000 tonnes in 1973-76 to less than 400,000 tonnes in 1993-96, despite much more corn being consumed within Canada. Over the twenty years, Canadian corn production increased from 3.2 to over 7 million tonnes annually.

The destination of Canadian wheat exports has shifted markedly. In 1973-76, about 14 percent of Canada's wheat exports went to Western Europe. This had fallen to 3 percent by 1993-96. In 1983-86, 28 percent of Canada's wheat exports went to the USSR but these countries imported virtually none during 1993-96. China became an increasingly important customer, taking 22 percent of the wheat exports in 1993-96. Iran emerged as a major buyer as did the United States and Japan.

The durum export pattern shifted from a large dependence on Europe (Italy) to China and the United States. Algeria, Brazil and Japan are now important customers with Algeria taking 37 percent of durum exports in 1993-96. Four countries (Saudi Arabia, the United States, China and Japan) are the major purchasers of Canadian barley, together taking almost 80 percent of exports.

In 1973-76, when Canada's canola industry was in its infancy, Japan took 80 percent (636,000 tonnes) of Canadian exports. In 1993-96, Japan imported an average of 1.7 million tonnes per year, but this was only 53 percent of Canadian canola exports. The United States, Mexico and Western Europe have become important markets for Canadian canola. Europe has remained the major destination of Canadian flaxseed; it took 60 percent of Canadian exports in 1993-96. Other major buyers were Japan (10 percent) and the United States (17 percent).

Production Technology

One of the key factors behind structural change in any industry is technological change. Bollman et al. (1995, p. 16) stated that "technology…is a fundamental driving force in the change in the size distribution of agricultural business units". Grain and oilseed production technology has changed enormously over the past 25 years.

One of the most noticeable changes in technology has been the large reduction in summerfallow in Western Canada (from 29 to 17 percent of arable land in twenty years). From the mid 1970s to the mid 1990s, arable crop land increased by 2.5 million ha. and, coupled with the decrease in summerfallow of 4.2 million ha., land under crops increased by 6.7 million ha. (Table 2). Two-thirds of the decrease in summerfallow area occurred in Saskatchewan. Information on the harmful effects of this practice has spurred farmers in all soil zones to adopt more crop intensive rotations.

Farming methods have changed enormously over the past 20 years. There has been a huge increase in the use of inorganic fertilizers (particularly nitrogen) and pesticides (especially more selective herbicides). In Saskatchewan, the percentage of total cropped area where commercial fertilizer was applied increased from 57 to 70 percent between 1991 and 1996; in Alberta, it increased from 75 to 81 percent (Table 4). Three-quarters of the cropped area in Saskatchewan (two-thirds in Alberta) were treated with herbicides (Table 4).

With increased knowledge of the deleterious effects of tillage on soil conditions, there has been a rapid movement towards longer rotations using fewer tillage operations. Between 1991 and 1996, the area using tillage methods which left most of the residue on top (a recommended conservation practice) increased from 25 to 31 percent of total cropped area in Saskatchewan and from 23 to 29 percent in Alberta (Table 4). Since the total crop area increased over the five year period in both provinces, this represented a 32 percent increase in total area where this practice was applied in Saskatchewan and a corresponding 29 percent increase in Alberta. Conversely, the former practice of incorporating most of the residue into the soil decreased from 62 to 42 percent of total cropped area in Saskatchewan and from 68 to 50 percent in Alberta (Table 4). The area of no-till practice increased from 10 to 20 percent of total cropped area in Saskatchewan between 1991 and 1995, and from 3 to 9 percent over that time period in Alberta (Table 4). This is a remarkable shift in farming techniques that seems to be continuing.

Table 4: Application of Selected Technologies as a Percentage of Total Area Cropped

	Saskatchewan		Alberta	
	1991	1996	1991	1996
	(%)			
Common Fertilizer Applied	57	70	75	81
Herbicides Applied	75	75	67	69
Tilled With Most Residue Left on Top	25	31	23	29
Tilled With Most Residue Inc. in Soil	62	42	68	50
No Till	10	20	3	9

Source: Statistics Canada, Census of Canada 1997

Pesticide use as a percentage of total farm expenditures approximately doubled in the prairie provinces between the 1970s and the 1980s (Table 5). Proportionate expenditures on pesticides continued to increase into the 1990s, though at a slower rate. Similarly, expenditures on fertilizer as a percentage of total costs in the prairie provinces grew rapidly between the 1970s and 1980s (more than doubling in Saskatchewan). This situation was reversed in Eastern Canada.

Table 5: Farm Pesticide and Fertilizer Expenditures as a Percentage of Total Gross Operating Expenditures: 1973-76, 1983-86, 1993-96

	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	BC	Canada
Pesticides										
1973-76	4.24	1.49	3.82	1.39	2.77	3.67	3.70	2.28	1.77	2.63
1983-86	5.24	1.73	3.52	1.51	3.40	7.20	7.20	4.67	1.53	4.33
1993-96	6.75	1.81	3.74	1.51	3.45	8.28	8.69	4.83	1.48	4.73
Fertilizer										
1973-76	13.30	5.18	8.81	5.88	7.34	10.46	5.04	8.00	3.50	6.93
1983-86	10.58	4.07	6.54	6.04	6.74	13.96	10.59	10.73	3.61	8.67
1993-96	10.85	3.38	6.30	5.01	6.20	13.85	11.99	9.60	4.09	8.39

Source: Statistics Canada, Census of Agriculture, annual.

Farmers have continued to substitute larger sized farm equipment for labour which has allowed them to farm larger areas (Table 1). Increasingly, they have turned to new machines like air drills to facilitate adoption of more crop intensive rotations, and no or fewer tillage operations. Greater use of direct combining (rather than swathing first), and natural and hot air driers have reduced labour constraints during

critical time periods at harvest. Increased use of steel bins with hoppers rather than the old wooden framed variety has also reduced demands on labour. Bollman et al. (1995) found that the capital/labour ratio of agriculture in Canada increased from below 1.0 in the early 1970s to above 1.5 by the late 1980s.

FORCES OF CHANGE

Goddard et al. (1993) suggested a number of factors that can affect the structure of agriculture. Based on their suggestions, this paper examines the influences of seven important factors on the emerging structure of the Canadian grains and oilseeds sector: agricultural research, prices, agricultural policies, transportation policies, international trade agreements, off-farm employment, and institutions and organizations. These are discussed in the following sections.

Agricultural Research

Agricultural research provides the basis for continued technological change in the grains and oilseeds sector. In Canada, much of the background research and extension necessary for the adoption of new technologies traditionally has been performed by the public sector. The Research Branch of Agriculture and Agri-Food Canada (AAFC) has been the most important agricultural research organization in the country. Guitard (1985) estimated that 50 percent of all agricultural research in Canada was conducted by the federal government, 35 percent by provincial governments and universities, and 15 percent by the private sector. In the three year period 1994-95 to 1996-97, total research expenditures by provincial governments averaged $143 million and $292 million by the federal government (AAFC, 1998).

Klein and Kerr (1995) noted four major forces that have changed research priorities and resource allocation: globalization, international protection of property rights, innovations in research techniques, and fiscal pressures.

Globalization has meant that Canadian grain and oilseed producers have become more exposed than ever to competition from producers in other countries as well as providing more opportunities to access new markets. As a result, it has become more important to develop new agricultural technologies and new crop varieties that directly match the needs of the industry. Research administrators in AAFC have increasingly sought counsel from knowledgeable people in the private sector. Advisory committees, composed primarily of experts from the private sector, have been struck at all the major research centres as well as at national headquarters in Ottawa to provide both strategic and tactical advice on the various research programs at the centres.

The reduction in barriers to trade and the revolution in information and communication technology has made it more important to protect research information internationally. The passage of the Canadian Plant Breeders' Rights Act in 1991 and a

supranational agreement in the new WTO gives much greater protection of intellectual property rights. By providing greater opportunities for profit, these institutional changes have stimulated investments in agricultural research by private sector firms.

There has been a revolution in research techniques which has affected agricultural research in recent years. The advent of laboratory-based biotechnological research has meant less national advantage from publicly supported research because foreign producers and consumers may reap many of its benefits. Although field testing will always remain location specific, new opportunities have been created for research laboratories to specialize internationally and "trade" their research resources and products.

Finally, fiscal pressures have left most governments with limited resources to protect and assist agriculture or any other industry (Hedley and Gellner, 1995). The Research Branch of AAFC has had to share major budget reductions with other Branches and Departments of the federal government. To maintain credible research programs in many areas, federal government scientists and their administrators have sought collaborative and cost-sharing arrangements with firms and institutions in the private sector. With increased financial contributions from the private sector has come increased private sector involvement in setting of agricultural research priorities.

During the past 25 years, provincial government research programs have been established in several provinces to supplement the work conducted by the federal government. The Alberta Agricultural Research Institute (AARI), established in 1987, annually allocates about $6 million for research deemed to be of economic benefit to the agricultural industry in Alberta. The Saskatchewan Agricultural Development Fund supports applied research projects in Saskatchewan. Other provinces also have programs which support agricultural research activities.

Increasingly, matching grant programs (where the private sector provides at least half the funds) have been used to provide cooperative approaches to agricultural research. The public sector supplements the funds when the proposed projects fit within identified priority areas for agricultural research. The combination of private and public sector decision making for funding agricultural research ensures that market signals guide the allocation of research resources while still maintaining benefits to the Canadian taxpayers.

Nearly all commodity organizations have begun to fund agricultural research in recent years. This has been in response to governmental exhortations to the private sector to contribute financially to public sector research programs as well as a growing appreciation by those in the private sector of the benefits from agricultural research. Generally, the funds are raised by deductions on sales of the farm produce, with provision for refunds upon application. Applications for research funds normally are reviewed by committees that represent the commercial interests of the organization and decisions are approved by the Board of Directors.

In 1981, 12 farm organizations banded together to form the Western Grain Research Foundation (WGRF). It uses the interest earnings on a $9 million fund (residual from a prairie wide program disbanded several years ago) to support grain-related research on the Prairies (Peterson, 1997). Beginning in the 1993-94 crop year, newly passed legislation allowed the Canadian Wheat Board (CWB) to deduct from the final payment $0.20 for each tonne of wheat and $0.40 for each tonne of export barley sold. This money goes into the account of the WGRF for the funding of wheat and barley research. An expert committee, composed of researchers and active farmers (50 percent each), makes recommendations about the distribution of these funds.

Although Canadian farmers have been quick to adopt new technologies as they became available, the highly regulated system for licensing new varieties of grains and oilseeds in Canada may have slowed the rate of technological growth in the sector. Canada has chosen to maintain high quality standards of hard red spring wheats (Dexter, 1993), preferring to concentrate on the high protein and gluten strength that the northern arid climate of the Canadian prairies makes possible. Candidate cultivars are required to go through three years of cooperative tests where they are grown under the same conditions as previously licensed varieties. Any new variety of wheat must fit the Canadian grading system and meet or surpass previous varieties on a wide array of characteristics, including agronomic merit, end use suitability, kernel characteristics and disease resistance. Failure to meet any one of the standards results in disqualification of the candidate cultivar.

Hughes (1986, p. 490) noted that development of new wheat varieties "in western Canada has been characterized more by gains in disease resistance, maturity and quality factors than in yield". Indeed, maximum yield potentials of hard red spring wheat have increased at the relatively low rate of only 0.23 to 0.40 percent per year (Depauw and Thomas, 1986). The process is costly as well as slow: of 151 candidate cultivars tested between 1973 and 1982, only seven (5 percent) were licensed (Hughes, 1986).

Passage of the Plant Breeder Rights Act in 1991 allows plant breeders to patent new varieties and collect royalties on their sales. This has created an important new incentive for plant breeders and has resulted in a much faster pace of new variety introductions: 15 new varieties of spring wheat were licensed during the four-year period 1991-94 as compared to 14 in all of the 1980s, 10 in the 1970s and 6 in the 1960s (DePauw et al., 1995). However, very small yield improvements have been made to date.

Prices

Grain and oilseed producers are known to respond to changes in overall price levels and changes in commodity and input price ratios. Average prices for wheat, barley and canola for the mid 1970s, mid 1980s and mid 1990s are shown in Table 6. While the nominal prices for these commodities have risen over this twenty year period, their real prices (measured in relation to the Consumer Price Index) have

fallen. This pattern of declining real prices over time is a continuation of a downward trend observed throughout this century (Fulton et al., 1989). The downward trend is a result of adoption of new technology that decreases average costs of production in a very competitive sector.

Table 6: Selected Commodity Prices, Nominal and Real (1992 dollars)

	Wheat		Barley		Canola	
	Nominal	Real	Nominal	Real	Nominal	Real
	$/tonne					
1973-76	135.36	391.30	103.00	298.55	262.91	762.06
1983-86	148.00	197.33	110.25	147.00	298.25	397.67
1993-96	165.33	158.97	122.67	117.95	351.33	337.81

Source: Saskatchewan Agriculture and Food. Agricultural Statistics.

While the real prices of all commodities have fallen over the past twenty years, some have fallen more quickly than others. The price of canola has risen against both wheat and barley (Table 7). This helps to explain the increase in canola area at the expense of area in wheat and barley (Table 2). Large increases in producers' costs of transportation since the mid 1980s strengthened that effect. Barley and wheat have much lower values per tonne than does canola resulting in an additional economic advantage from growing canola. This also applies to other high value, low volume crops that increasingly have been grown in Western Canada.

Table 7: Product Price Ratios

	Canola/Wheat	Canola/Barley	Wheat/Barley
1973-76	1.94	2.53	1.31
1983-86	2.01	2.70	1.34
1993-96	2.12	2.86	1.35

Source: Saskatchewan Agriculture and Food. Agricultural Statistics.

While output price ratios affect which crops are produced, input price ratios affect how the crops are produced. The price of labour has been increasing faster than the price of capital, thus contributing to the decreasing use of labour. Between 1986 and 1996, the price of hired farm labour increased by 36 percent whereas the price of machinery replacement increased by 25 percent and the price index of machinery operation increased by 31 percent (Saskatchewan Agriculture and Food, Annual). But this is only part of the story. Schultz (1972) suggested that the relative increase in the price of farmers' own time (their opportunity cost) relative to the price of capital may

explain more of the substitution than just the price of hired labour. Subsidies on capital such as the income tax credit for farm machinery in the 1970s and 1980s further decreased the capital/labour price ratio, thus accentuating the trend.

The second major change in production methods in Western Canada has been the large increase in use of fertilizers and pesticides. Crop prices have been rising more quickly than have pesticide prices, helping to explain the increased use of pesticides. Fertilizer prices declined steadily from the mid 1980s until 1993 when they began to rise rapidly. By 1996, the fertilizer price index in Saskatchewan was 26 percent higher than it was ten years earlier; the pesticide price index also increased 24 percent over the ten year period but the crop price index increased even more: 40 percent (Saskatchewan Agriculture and Food, Annual). The use of these inorganic inputs has also increased because of the change to more crop intensive rotations in the prairie provinces: more fertilizers and pesticides are required for successful cropping on stubble than on summerfallow.

Agricultural Policies

Canada has a long history of government involvement in agriculture. Following World War II, both levels of government developed extensive agricultural programs in marketing, transportation, credit, price and income support, and input subsidies that were designed to alleviate income stresses on farms during periods of price or yield reductions. Many of those programs distorted economic signals and delayed adjustments in resource use on farms across the country. Since the late 1970s, many of the programs have been rationalized or dismantled. Total federal and provincial government support for agriculture was over $9 billion in 1991-92; that had been cut in half five years later (AAFC, 1998).

Stabilization and Income Support. Grain and oilseed production in Western Canada has been subject to extreme variations in both yields and prices. For this reason, increased stability of returns has been a primary focus of agricultural policies. In Canada, stabilization programs usually have been designed to provide a large measure of price or income support as well.

The Crop Insurance Act of 1959 makes all-risk crop insurance available to crop producers in all provinces. This program has provided insurance against reduced yields as a result of natural hazards like frost, drought, insects, diseases, and hail. In general, producer premiums have been matched by the federal government with the provincial governments paying for the administration costs. It is likely that crop insurance has resulted in some increase in input usage and crop output. During the 1960s and early 1970s, producer premiums slightly out-weighed payments from the insurance (Fulton et al., 1989). However, major reductions in yields during several years in the 1980s triggered very large payments to producers. During the four year period 1983-86, net crop insurance payments to producers (over and above producer premiums) averaged $294 million per year, representing 3.47 percent of total crop receipts (Table 8).

The Western Grain Stabilization Plan (WGSP), introduced in 1976, sought to stabilize net margins above variable costs for the major grains and oilseeds grown in Western Canada. When the program started, it was agreed that producers would pay one-third of the costs and government would pay two-thirds. However, huge pay-outs of over $3 billion in the four year period 1983-87 left the WGSP fund with a staggering deficit, most of which eventually was paid by the federal government. The program was ended in 1990.

Table 8: Net Payments from Crop Insurance as Proportion of Total Crop Receipts for Canada (Thousand Dollars): 1973-76, 1983-86, 1993-96

	1973-76	1983-86	1993-96
Net Farm Payments	15,997	294,530	171,173
Total Crop Receipts	4,111,113	8,496,041	11,854,080
Percent	0.39	3.47	1.44

Source: Statistics Canada, #21-603-UPE.

The WGSP increased and stabilized producer returns during its existence, especially when prices were depressed during the mid 1980s.† This may have supported land prices at higher levels. Miranda et al. (1994) found that the program increased area of eligible crops planted by over four percent, most of which was due to the risk reduction effect of the program.

A number of other *ad hoc* programs were made available to alleviate problems in particular years and regions. For example, crop assistance payments were made to crop producers in most provinces who were unable to plant a substantial portion of their intended crop due to cold, wet weather in 1974. In 1983, special assistance payments were made to crop producers in Quebec, Manitoba and Saskatchewan who suffered yield losses due to floods, winter-kill and drought. Under the Crop Drought Special Assistance Act of 1985, Saskatchewan crop producers were provided payments to compensate for yield losses. In 1986, crop producers in Saskatchewan, Alberta and British Columbia who suffered crop damage due to drought conditions received payments under the Crop Disaster Assistance Program. Farm income assistance was provided to grain and oilseed producers in Western Canada to improve incomes which were reduced as a result of the low international prices for grains.

The Special Canadian Grains Program was instituted as a temporary measure to provide cash payments to Canadian grain and oilseed producers who were negatively affected as a result of the grain subsidy war being waged by the United States against the European Union. Large payments were made during two years: $1 billion in 1987 and $1.1 billion in 1988. About 85 percent of the payments went to producers in Western Canada. Since the special programs were announced after crops had been planted and harvested, it is unlikely that they caused any changes in resource

†Editor's Note: Boyd and Love (Using Commodity Options and Crop Insurance for Revenue Stabilization, 1994) showed that some government programs, including WGSP, had some destabilization effects on annual revenue.

allocation. However, Fulton et al. (1989) argued that some producers may have altered their planting intentions slightly during the second year in anticipation of another payment. They stated that the extra cash undoubtedly assisted producers in the purchase of additional inputs (and to make debt payments), thus providing major benefits for input suppliers and the rest of the regional economy.

The Farm Support and Adjustment Measures Act (I and II) in 1990-91 provided interim support to grain and oilseed producers until new long-term safety net programs were fully implemented. The Farm Income Protection Act of 1991 spawned two new safety net programs: the Gross Revenue Insurance Plan (GRIP) and the Net Income Stabilization Account (NISA). The GRIP was really an extension of the crop insurance program in that it protected against reductions in revenues as well as yields. Producers paid one-third of the costs of the program and governments paid the other two-thirds. Revenue protection was based on the 15 year moving average of past market prices for each product and a producer's long term average yield. Large pay-outs occurred in the first couple years of the program because some very high prices from the late 1970s were included in the moving average. As the high price years were dropped from the moving average and replaced by lower price years in the 1990s, the program went out of favour and was discontinued in 1996 with small surpluses showing in accounts in most provinces.

Gray et al. (1991) concluded that the GRIP was structured in a way that affected cropping patterns, input usage and land use. They noted that 15 year average prices do not reflect current demand and supply conditions and the program provided farmers with inaccurate market signals that would change crop selection choices. Since the program's target revenue was higher than expected market revenue in the early years, producers had an incentive to reduce their use of fertilizer and other inputs, and accept a program payment. Also, since forage and pasture land were not included in the program, producers had an incentive to convert some of that land to annual crop production.

The Net Income Stabilization Account (NISA) is not commodity specific so is less likely to affect resource allocation. Under NISA, individual producers establish personal accounts at a financial institution where they can deposit up to three percent of their eligible net sales, which are then matched by government contributions. After receiving a competitive interest rate, the government adds an interest bonus of three percent. Withdrawals from the account are permitted when the producer's gross margin falls below the previous five-year average or taxable income falls below $10,000. Spriggs and Nelson (1997) found that NISA increases disposable income and increases stability but they didn't study any possible impacts this may have on resource allocation.

Price Support. The major program that provided price support for prairie grain producers was the two-price wheat program. It was introduced in 1967 to provide some level of stability to the price of wheat used for domestic consumption (around 10 percent of total production). The program was designed with a floor price which

consumers were obligated to pay even when the world price declined to a lower level. Domestic consumers paid the international price if it was between the floor and ceiling prices, but no more than the ceiling price.

In the early years of the program, world prices were frequently below the floor price, so producers benefitted. During the late 1970s, world prices exceeded the ceiling prices for some time, so domestic consumers benefitted. However, a major upward revision in the floor price in 1986, coming at almost the same time as the worldwide plunge in wheat prices, set the stage for a major income transfer from consumers to producers. In 1987, the domestic price of wheat in Canada was $257 per tonne, while the world price averaged only about $95 per tonne. Fulton et al. (1989) estimated that a typical Saskatchewan farmer who produced 18,000 bushels of wheat in 1987 would have gained approximately $10-12,000 in additional revenue from the two-price program. However, they argued that the program had minimal effect on resource allocation in the prairie region, primarily because it ended abruptly in 1988 when Canada signed a trade agreement with the United States.

Input Subsidies. A plethora of subsidy programs have been used to reduce input costs (and indirectly increase output) in the Canadian grains and oilseeds sector. These include subsidies on:

- electricity (in Quebec, 1987-92);
- fuel (federal excise gasoline tax rebates to producers in all provinces, 1976–92; provincial fuel tax rebates to producers in Quebec 1981–date, Ontario 1975–date, and Saskatchewan 1974–date);†
- natural gas (in Alberta, 1985–date);
- interest (several provinces, most since the late 1970s or early 1980s);
- fertilizer (in Nova Scotia since 1974, Quebec 1971–82, Alberta since 1985);
- lime (in Nova Scotia, New Brunswick, Quebec, Alberta and British Columbia—all programs now ended);
- pesticides (in Alberta to assist with grasshopper control 1985–87);
- property taxes (in Quebec since 1973, Ontario since 1971, Manitoba 1971–88, Saskatchewan 1971–86);
- wages (assistance in all provinces since 1992 under the Summer Experience Wage Assistance Program).

Marketing. The Canadian Wheat Board (CWB), a federal agency, has dominated grain marketing in Western Canada since it became the compulsory marketing agency for wheat grown in the prairie provinces in 1943. The government added oats and barley to its responsibilities in the 1948-49 crop year. It was responsible for all sales of these grains outside of the prairie region and across provincial boundaries.

†Editor's Note: On the prairies, provincially untaxed (purple) farm fuel has existed for years.

The extensiveness of the power of the CWB eventually led to changes. A new feed grain policy was introduced in the 1973-74 crop year which took away the exclusive power of the CWB to sell feed grains within Canada. Oats was removed from the Board's authority in 1989. It has never marketed oilseeds although it regulated flows of flax, canola and rye in the grain handling system by delivery quotas and car allocation. Although the CWB may grant other firms permission to export, it controls the marketing of wheat and barley for export and for human consumption within Canada.

The CWB is based on pooling returns where the producer receives an initial payment at time of delivery to one of the grain companies that serve as agents of the CWB. The revenue pooling accounts operate over an August 1 to July 31 crop year. When the accounts are closed (usually in October) unsold grain is transferred to the new account, deductions are made to cover the CWB's costs and a final payment is issued to producers. If the account has incurred a deficit the losses are covered by the federal treasury. This has happened only rarely in CWB history, and most frequently on barley.

Recently a number of changes have been made to the CWB to make the grain marketing agency more market responsive for a globalized economy.

- Grain for human consumption within Canada has been priced off United States markets to ensure competitive pricing for Canadian millers and bakers.
- Since 1993, the CWB has provided forecasts to producers through monthly publication of pool return outlooks. This has allowed producers to make more informed production and marketing decisions.
- The pooling system was changed at the beginning of the 1995-96 crop year to correct an internal pricing distortion. Formerly, all producers in the CWB area pooled the costs of grain transportation beyond Thunder Bay to the lower St. Lawrence River from where the grain was loaded onto ocean-going vessels for export. Since the change, individual producers have to pay for all freight charges to either Vancouver or the lower St. Lawrence River, whichever is less expensive. This has made farm level prices in Manitoba and eastern Saskatchewan the lowest on the prairies and increased prices somewhat in Alberta.
- Legislative changes to the way the CWB is organized and run have been passed by the Canadian Parliament. Governance will be under the control of a 15 person board of directors, 10 of which will be elected by producers. The changes will also increase operational flexibility of the organization by allowing it to purchase grain at spot prices outside the pool. Other changes are likely to be made.

The Ontario Wheat Producers' Marketing Board, a provincial marketing board, has controlled marketing of wheat in that province. Domestic use is much more important for Ontario than prairie wheat. It has operated under similar

principles to the CWB but allowed no buy-back option like that available in western Canada. Producer delegates recently voted to end its export monopoly. If implemented, this change would provide producers the option of selling all their wheat to the Board or exclusively in the export market.

Credit. Provincial and federal governments have been active in providing credit to agricultural producers throughout Canada. The programs often have been directed towards smaller producers or new entrants who faced difficulties in securing credit from regular commercial sources. Many of the provincial government programs were directed towards encouraging particular kind of enterprises, e.g., expansion of livestock or specialty crops. Some provided subsidized credit for the purchase of inputs. Many of the programs offered subsidized interest rates though the extent of subsidization has not been great in recent years.

The vast majority of funds extended by the federal program (Farm Credit Corporation) were to finance transfers of land. Fulton et al. (1989) argued that the programs likely had only minor impacts on overall resource allocation and quantity of output. In a study of the effects of four provincial agricultural credit programs (loans provided by la Société de Financement Agricole du Québec (SFAQ), the New Brunswick Agricultural Development Board, the Manitoba Agricultural Credit Corporation, and FarmStart and the Agricultural Credit Corporation in Saskatchewan), where the effective subsidies ranged from an average of 3.31 percent in Manitoba to 5.43 percent in New Brunswick, Gunjal et al. (1996) found evidence that the subsidies did have a small effect on land values but didn't mention any possible effects on resource allocation.

Since 1957, the federal government also has provided interest-free cash advances on stored grains under the Prairie Grains Advance Payments Act. The program was stopped in 1989 but a new program was begun in 1990 to restore interest-free cash advances.

United States Policies. The major United States policy affecting the Canadian grains and oilseed sector has been the Export Enhancement Program (EEP) which was part of the Food Security Act of 1985. Its stated purpose was to increase United States exports by meeting subsidized competition from the European Union. EEP subsidies have been paid in certificates which can be exchanged for an equivalent value of grains held in government stocks. Most of the EEP subsidies (more than 70 percent) were provided for sales of wheat, including durum (Anania et al., 1992).

The main effect of the EEP was to lower world prices because competing countries, such as Canada, had to match the lower prices. Although one of the stated objectives of the EEP was to compete only in countries where the European Union (EU) was making subsidized sales and to not harm other exporters, Anania et al. (1992) found that the EEP harmed other exporters far more than it harmed the EU. A further effect of the EEP was that it increased prices of grain within the United States because the subsidy was paid only if it was exported to specified

countries. This led to increased exports of Canadian grain to the United States since it diverted "…United States supply offshore and made more of the lucrative United States market available to Canada" (Alston, et al., 1997, p. 1309).

Transportation Policies

Statutory Freight Rates. Canada had a system of regulated rates for transporting western Canadian grains and oilseeds to export terminals that lasted for nearly 100 years, from 1897 until 1995. Freight costs increased rapidly during the inflationary 1970s. By 1981 it was estimated that shippers of statutory grains paid less than twenty percent of the costs of moving grain. Due to losses sustained in transporting grains and oilseeds, the railroads had little incentive to replace or maintain the grain transportation network. As the transportation system for grain deteriorated, the results were lost grain sales, additional on-farm storage costs and outdated grain handling and transportation technology.

While it was not the sole policy responsible, the widening gap between the full cost of transporting grains to terminal positions and the cost paid by farmers contributed to a number of distortions in the market signals received by those involved in prairie agriculture. Artificially low freight rates meant higher grain prices at the farm level in Western Canada but had no such effect on grain prices in Central and Eastern Canada. The effect was to penalize the livestock and other value-added sectors in Western Canada. Canola crushing and feed processing firms all had to pay higher prices for their oilseed and grain inputs. The transportation subsidy provided an incentive to locate processing plants closer to centers of consumption which often were situated outside the prairie region and, in many cases, outside Canada.

By the early 1980s, the federal government no longer felt obliged to make payments in the manner that had prevailed during the past 85 years. After prolonged debate, the Canadian Parliament passed the Western Grain Transportation Act (WGTA) in November 1983 which replaced the fixed statutory freight rates on grain with rates that were meant to reflect changing costs of grain transportation. Although the WGTA limited government subsidies on transportation, the subsidies were paid directly to the railroads thus maintaining higher on-farm prices for grains and oilseeds. At the time of the demise of the WGTA (August 1995), western Canadian producers were paying about half the total estimated transportation costs.

The program ended with a $1.6 billion payout to owners of prairie farmland, $300 million adjustment assistance fund and $1 billion in new export credit guarantees to help sales of agricultural products in world markets. Since then, prairie grain and oilseed producers have had to pay the entire cost of moving their products to export terminals (though maximum freight rates are still regulated by the Canadian Transportation Agency). The resultant lower farm prices have stimulated growth of the livestock sector in Western Canada and, with it, a movement away from production of crops for export and towards crops that can be fed or processed closer to home.

Feed Freight Assistance. The Feed Freight Assistance (FFA) program also disappeared at the end of the 1994-95 crop year. Since 1941, it had paid part of the costs of transporting feed grains to feed deficit regions of Canada (most parts of British Columbia, eastern Quebec, Atlantic provinces, Northwest Territories and Yukon). Cost of the program at its dissolution was about $15 million per year. A $62 million adjustment fund is being paid over ten years to help develop agriculture in the affected regions.

Subsidization of transportation costs for feed grains discouraged feed grain production in many of the feed deficit provinces. Since 1976, most of Ontario and the St. Lawrence region of Quebec had not been eligible for the subsidy. The Yukon and Northwest Territories were added to the program in 1980. In 1984, locally grown grains became eligible for FFA payments, thus stimulating feed grain production in the eastern provinces. During the 1980s, the level of subsidization was reduced so that end users of prairie feed grains had to pay a greater proportion of the total transportation costs. By 1990, only about 25 percent of the transportation costs beyond Thunder Bay were paid by the FFA program.

International Trade Agreements

North American Free Trade Agreement. Canada and the United States signed a trade agreement (CUSTA) which came into effect on January 1, 1989. Mexico joined in 1994 to make it a tri-national arrangement: the North American Free Trade Agreement (NAFTA). Although the outcome of the negotiations was significantly less than many had hoped, a number of important changes were made. The main features that affected the grains sector are described briefly below.

- Tariffs on most agricultural products were eliminated over a ten year period (by 1998), with tariffs on many products eliminated immediately when the Agreement took effect and others after a five year period.
- Prior to the signing of the CUSTA, the CWB (in conjunction with the Department of External Affairs) restricted the importation of grains from the United States through an import license requirement. To prevent retaliation by the United States for this trade barrier, exports of grains to the United States were restricted voluntarily (Kerr, 1989). With the signing of CUSTA, Canada agreed to remove import licenses on wheat, barley and oats when United States support levels for these commodities became equal to or less than the Canadian support level. A formula was agreed to by which the support levels could be calculated and compared.
- Neither country was allowed to use direct export subsidies to ship products to each other. Canada agreed to stop subsidizing transportation costs of grain and oilseed products exported to the United States through west coast ports.

It is now almost ten years since CUSTA came into effect. Although many factors in the dynamic economies of the two countries affect year-to-year differences in trade, there is convincing evidence that trade in grains and oilseeds between the two countries has increased since the agreement took effect. Goodloe and Simone (1992) noted that, already by 1990, U.S. exports to Canada of grains had increased by more than 60 percent from their 1988 (pre-Agreement) levels and Canadian exports to the United States of grains and oilseeds had increased by more than 20 percent.

The two-price wheat program could not be sustained after CUSTA came into force because Canadian millers and bakers could not be prevented from importing wheat or wheat products. To save the Canadian domestic market for Canadian wheat producers, the Canadian government promptly announced the abandonment of the two-price wheat program effective with the start of crop year 1988-89. Producers received some assistance for the program's end under the Two-Price Wheat Compensation Act.

Since Canadian subsidies were lower than those in the United States at the time the CUSTA came into effect, Canadian grains and oilseeds were permitted into the United States immediately. Canada opened its border to United States oats in 1989 and wheat in 1991. Although the calculations still show United States subsidies on barley to be slightly higher than Canadian subsidies on barley, the tariff on imports of United States barley was suspended in late 1997.

Canada has increased its exports of grains and oilseeds (and their products) to both the United States and Mexico since NAFTA came into existence. In the period 1973-76 Canadian trade with the United States was 340,000 tonnes of which 268,000 was barley (less than two percent of total Canadian grain and oilseed exports). Trade with Mexico was virtually non-existent except for a small amount of wheat and canola. In the period 1983-86 (prior to CUSTA) Canadian exports to the United States increased only marginally to 481,000 tonnes (1.6 percent of Canadian exports), of which about half was wheat. Trade with Mexico had developed by the mid 1980s with exports of 359,000 tonnes.

This pattern changed sharply after the CUSTA came into force in 1989. By the 1993-96 period, Canadian exports to the United States had increased more than ten-fold to 4.4 million tonnes. By then, the United States was importing all commodities from Canada, including soybeans. The U.S. market for Canadian wheat (excluding durum) took 9.3 percent of Canadian wheat exports. Durum exports to the United States were 325,000 tonnes (compared to only 16,000 tonnes in 1983-86) representing 9 percent of Canadian durum exports. Oats exports averaged 983,000 tonnes (compared to 101,000 tonnes in 1983-86) which was 96 percent of Canadian oat exports. Barley exports were 1.2 million tonnes (compared to 90,000 tonnes in 1983-86) representing 33 percent of Canadian barley exports. Canola and flaxseed exports averaged 339,000 tonnes (up from just 39,000 tonnes in 1983-86). Exports to Mexico increased significantly to 1.1 million tonnes, mostly wheat and canola. Together, trade with Mexico and the United States accounted for 22 percent of total Canadian grains and oilseed exports.

The granting in 1985 of "generally regarded as safe" (GRAS) status to low erucic acid rapeseed by the Food and Drug Administration in the United States permitted the marketing of canola oil in the United States. Canola oil has developed a reputation as one of the healthiest edible oils due to its low level of saturated fat and high level of monosaturated fat. In the period 1993-96 Canada exported an average of 332,000 tonnes of canola oil to the United States (compared to only 25,000 tonnes per year in the 1983-86 period). This constituted 86 percent of Canadian canola oil exports. Similarly canola meal exports have increased. The United States imported 637,000 tonnes per year during 1993-96, accounting for 60 percent of Canadian exports.

World Trade Organization. With the successful conclusion of the Uruguay Round of GATT negotiations in 1994, Canada, like all other member countries, agreed to increase other countries' access to Canadian markets, and to reduce internal support and export subsidies. All non-tariff import barriers were converted to bound tariffs which are to be reduced by an average of 36 percent (minimum of 15 percent) by the year 2001 (Brooks and Kraft, 1995). The tariff on wheat was set at 4.4 percent (decreasing to 1.9 percent by 2001) on the first 136,130 tonnes (rising to 226,003 tonnes by 2001). The over-quota tariff was set at 90 percent for common wheat and 57.7 percent for durum wheat (both to be reduced by 15 percent by 2001). A low tariff of 2.3 percent (decreasing to one percent by 2001) was set on feed and malting barley for the first 239,400 tonnes (rising to 339,000 tonnes by 2001). The over-quota tariff was set at 25.1 percent on feed barley and 111.4 percent on malting barley (both to be reduced by 15 percent by 2001).

The subsidy for transporting Western Canadian grains to export terminals was considered an export subsidy which Canada (and other signatories) agreed to reduce over the six year implementation period of the WTO. The Canadian government chose to remove the transportation subsidy (WGTA) altogether in August 1995 rather than reduce it gradually. Canada agreed to reduce the level of domestic internal supports (as calculated by an aggregate measure of support) by 20 percent from the 1986-88 base period. However, by the time the agreement went into effect, Canada had already exceeded the required level of cuts (Brooks and Kraft, 1995). Further reductions in internal support have taken place since that time.

Off-Farm Employment

The increase in availability of off-farm employment opportunities has countered, to some extent, the decrease in number of farms and the increase in average farm size. Off-farm employment, by bringing in wages and salaries, has permitted small farm producers to remain in business even though farm receipts do not always cover the living costs.

The higher educational levels among today's farmers has increased their opportunity costs and exposed them to a multitude of off-farm job opportunities. Farmers are now as well educated as their urban counterparts: average years of formal education among "classic farmers" (defined as farm operators with net farm

income and a farm related job) in 1991 was 12.3 compared to 12.5 in the population as a whole (Statistics Canada, 1995). Off-farm income represented 59 percent of total income among the agricultural population in 1991 (Statistics Canada, 1995). Even the identified "classic farmers" obtained 25 percent of their total income from non-farm employment.

Brown (1989) noted that off-farm employment can be considered a form of diversification. Due to the inherent instability of grain and oilseed farms, producers have sought off-farm employment as a way of diversifying income sources.

Institutions and Organizations

A large number of institutions and organizations affect performance of the grains and oilseeds sector in Canada. Changes in regulations and institutional structures have been occurring rapidly in Western Canada during the past ten years. Changes in three major areas are discussed below.

Government Institutions. After operating for decades under a highly regulated regime, many public services and institutions have been partially deregulated, privatized or under threat of major changes in the functions they perform. It is clear that the government intends to make grain handling and transportation in Canada more commercially oriented.

The Canadian Grain Commission (CGC) is responsible for, among other things, licensing country and terminal elevators under the Canada Grains Act. Until recently the CGC set maximum tariffs for handling grain. As part of a restructuring and partial deregulation of the CGC, grain companies have been freed to set their own rates for elevation, cleaning and storage. This has increased competitive behaviour among grain companies. Also, many of the inspection and grading services formerly provided by government have been fully or partially privatized. Where government employees still provide these services, users are now required to pay some portion of the costs.

The Grain Transportation Agency has been disbanded, thus getting government out of the business of coordinating rail transportation. The 1996 Canada Transportation Act removed regulations that prevented abandonment of branch lines. Formerly, 10,000 miles of prairie branch lines were protected by legislation. Now, the railroads can abandon any lines they find unprofitable after giving sufficient notice to affected parties. While this decision increases the profitability of the railroads, it greatly increases transportation costs for producers who live close to these lines. They can be expected to alter their cropping patterns and resource use with the changed conditions.

Grain handling. Major changes have occurred in the system for handling grains and oilseeds in Western Canada. The trademark "prairie sentinel" primary elevators (wooden structures built as long ago as 1900) have been disappearing at a staggering

rate (Table 9). Some have been replaced by high throughput capacity inland terminals. Overall storage capacity has shrunk, but the volume of grain handled by each has increased sharply.

Associated with the rapid demise of small primary elevators has been the arrival of multi-national companies interested in establishing themselves in the business of handling grain in Western Canada. Cargill has owned a large number of primary elevators since purchasing the National Elevator company in 1975. In 1997, American corporate giant Archer Daniels Midland bought 45 percent of United Grain Growers; Marubeni, a Japanese trading company bought 5 percent. Another corporate giant, Con-Agra announced in 1997 that it was building three large elevators in Saskatchewan. Louis Dreyfus Canada Ltd. recently announced plans to open at least three high volume elevators in Western Canada, with the first in Tisdale, Saskatchewan (Ewins, 1998). The prairie wheat pools, particularly the Saskatchewan Wheat Pool, have begun (or announced) major investments to modernize their primary grain collection structures. As well, many smaller companies (including local groups of farmers) have invested in high throughput grain elevators on the prairies.

Table 9: Elevators and Capacities in Western Canada

	1965	1977	1997
# Primary Elevators	5,145	3,658	1,153
Storage Capacity	10.7 mt	9.2 mt	6.6 mt
# Terminals	24	14	
Terminal Capacity	3.5 mt	2.6 mt	
# Process Elevators	30	24	
Process Capacity	0.58 mt	0.60 mt	
# Transfer Elevators	27	14	
Transfer Capacity	3.4 mt	2.4 mt	
Movement to West Coast	8.3 mt	11.7 mt	
Movement to Thunder Bay	13.2 mt	8.8 mt	

Source: Canada Grains Council, Statistical Handbook. Various years.

Producer costs of transporting grains and oilseeds from the prairie provinces to export terminals have increased dramatically with the abandonment of subsidized freight rates and partial deregulation of the grain handling and transportation system (Table 10). This much higher cost has provided incentives for growth of the livestock sector, production of lower volume, higher valued crops, and more value-added activities in the prairie region.

Table 10: Posted Charges for Handling and Transporting Grains and Oilseeds from Mid-Prairie to Export Terminals*

	1987	1997
To St. Lawrence Ports	45.54	76.33
To Pacific Ports	24.72	53.80

* Includes charges for elevator handling, shrinkage, dockage, carrying, railway freight, terminal elevator, lake transportation (to St. Lawrence), transfer position, fobbing, and marketing.
Source: Canada Grains Council, Statistical Handbook, 1987 and 1997.

While the grain handling system remains heavily regulated with central car allocation and CWB planning, some discussions have occurred about changing to a completely deregulated system based on bargaining and contracts. Further deregulation could stimulate more extensive changes in the western Canadian grains and oilseeds sector.

Farmer Organizations. A number of producer organizations representing various commodities have come into existence during the past 25 years. These were formed to help overcome perceived market and institutional failures of the existing market system. For the grains and oilseeds sector, a key problem has been insufficient investment in research and market development.

The Canada Grains Council was formed in 1969. Member organizations represent a cross section of Canada's grain and oilseed sector including handlers, transporters, merchants, trade associations, producer groups, financial institutions, governments and universities. Research has been conducted to address various issues and problems in the industry as seen by member organizations. The Council converted in the 1990s from primarily research functions to, now, almost exclusively an industry information function.

The oldest and possibly the most effective of the organizations has been the Canola Council of Canada. Formed in 1967 as the Rapeseed Association of Canada, the Council serves as an umbrella organization which brings together all groups which have a stake in canola. Its activities include market development through promotional programs, improvements in production through research and producer education, collection and dissemination of information to assist in decision making, and good public relations. Its market development efforts include seminars, feeding trials for canola meal, trade missions, advertisements, displays, and publications. Most importantly, the Council sets the research direction for the commodity and assists in the coordination of research activities. Production has been assisted in ways such as development of new varieties, testing of chemicals, and producer education to improve canola management.

The Western Canadian Wheat Growers Association represents producers who would like to see changes made in the way western Canadian wheat is marketed. In particular, they favour less regulation and more opportunities for private entrepreneurship

in the marketing function. Organizations which represent producers of virtually all grains and oilseeds have been formed in Western Canada, including barley, flaxseed, potatoes, vegetables, and pulses. Efforts are underway to form producer organizations for rye and oats.

CONCLUSIONS

Major changes have occurred in the Canadian grains and oilseeds sector during the past 25 years. More canola and less wheat have been grown and exported in Western Canada. Corn and soybean areas and yields have increased in Ontario and Quebec. Major developments in production technologies have changed the ways these crops have been grown. A large number of factors have caused the changes, the most important of which have been:

- Agricultural research has become more focused on producer concerns as a result of greater private sector participation in setting of research agendas.
- Changes in price ratios favouring the growth of canola and the use of more specific inputs, especially fertilizers and pesticides.
- Reductions in agricultural subsidies which formerly distorted price signals.
- Scrapping of two major transportation programs that subsidized the movement of grains and oilseeds out of Western Canada, creating the conditions for greater value-added processing on the prairies.
- Bilateral and multilateral trade agreements that reduced barriers to international trade and directly exposed Canada's grain and oilseed producers to greater competitive pressures.
- Higher levels of education and larger machines allowing many producers to supplement their farm incomes by finding off-farm employment opportunities.
- Major changes in the institutions and organizations that serve the grains and oilseeds sector.

The structure of the Canadian grains and oilseeds sector continues to evolve. Evolution has been most pronounced in the 1990s to date. It is impossible to predict where it will go from here. It's likely that increased rail line abandonment will lead to some conversion of marginal crop land into pasture land.

The performance and costs of the CWB in marketing wheat and barley have come under increased scrutiny and debate over the last several years (Veeman, 1998). Many producers wish to retain the organization that has served them for over 50 years. Others want choice in marketing. There is some evidence that the new grain handling system may be over-built in certain areas which might necessitate consolidation and further rationalization.

The next round of multilateral trade negotiations are scheduled to begin in 1999. The Canadian grains and oilseeds sector has a huge stake in the outcome. Having become more market oriented and competitive as a result of less government involvement and continued technological improvements, the sector is in position to benefit from further relaxation of barriers to trade in all agricultural commodities.

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CANADIAN SEED TRADE ASSOCIATION

Bill Leask

While these discussion comments focus on the Canadian grains sector, most of my comments will be applicable to both Canada and the United States. After three general comments about the papers, I will relate some of the impacts of new technologies on the sector.

First of all, the grains papers represent very concise compilations of the events that have happened and are influencing the structure of the grains industry. As a general synthesis, I see three major drivers of change: globalization, deregulation and technology. Most of the elements of change can be traced to one of these three drivers.

Linda Young commented that one of the main drivers for research is to reduce costs. I would argue that one of the main drivers for research is to add value.

There was discussion about international buyers' demand for our high quality grains. What is "high quality?" Quality is determined by the customer. "High quality" is defined in terms of the purposes for which we use that particular grain. Our standards may be completely unacceptable for the uses of international customers and, therefore, could be considered "low quality" from a consumer perspective. Consequently, the term "high quality" does not mean anything except in the context of customer demand. What we are trying to do is develop products which meet the specifications of the customer.

For 15 years, I have been actively involved in the seed industry, working with new technologies and helping draft the regulations which allow them to be tested and used. Lately, I have also been involved with issues of customer acceptance of our genetically modified organisms (GMOs) in Europe and other countries. With these new technologies, crop protection will not come by chemical means, but by biotechnological means. In other words, it will come in the seed rather than in a container. The crop protection industry itself projects that over the next ten years, global sales of their products will fall from some $30 billion to approximately $15 billion. They project that the seed industry will grow by some $20 billion over the next decade.

It is interesting to rank the relative sizes of countries' seed industries. Canada is valued at about $350 million. We are about the same size as the Netherlands. Japan is about six times larger than we are. Many people find that peculiar, but the value of your seed industry has more to do with the level of your research activities than your land base. If the crop protection segment of the seed industry is going to increase by

$20 billion, what are the opportunities of Canada, Mexico and the United States to capture that growth? Whether that opportunity is realized will be determined entirely by the level of research and development investment.

One area which has not been touched upon yet, is the impact of the Rio Biodiversity Convention of 1992. The objectives of the convention are conservation, sustainable use and equitable sharing of benefits. The convention will have a very profound impact on our industry. Currently, we are trying to get European acceptance of products of biotechnology, such as corn and canola. The consumer sector of Europe, actually environmentalists, are looking for GMO-free products. We are at the vanguard of biotechnological developments—particularly in crop production. Presently, it is intended that, after production, GMO products will be commingled or blended with all other varieties, and move on down through the food chain or through our bulk handling system as a single uniform product governed by grades. Technically, with only one field of production commingled into the bulk handling system; you no longer have GMO-free commodities. With GMO-free limits, you cannot ship anything from a bulk system that commingles.

The problem with the Rio Convention is that it falls under the environmental program of the United Nations. Therefore, the federal agencies representing the environment—such as Environment Canada and the U.S. Environmental Protection Agency—take the lead role. These agencies take the position that before any modified product can be imported into a country, it must be approved in that country. Technically, before the first acre of any GMO material is planted, you have to get approval by every potential export market. Currently, it costs between four and five million dollars to get the early approvals out of Europe. For instance, in canola, Canada has early approvals from only four of the fifty export country customers. Unless the World Trade Organization (WTO) and other bodies are willing to engage the health and environment ministries in a meaningful way, those groups are going to use the Rio Convention for Biodiversity to de-globalize and re-regulate this industry.

Concerning intellectual property and plant breeders' rights, the Canadian version of plant breeders' rights is like the old IBM personal computer—the 1088 or 286. It is better than the Monroe calculator, but it is a long way from a Pentium. The Union Internationale pour la Protection des Obtentions Végétales (UPOV) is an organization of countries with Plant Breeders Rights (PBR). Canada's PBR conforms to the UPOV 1978 Convention. The UPOV 1991 Convention has some very important provisions which we need to address here in Canada to remain competitive. The UPOV 1991 Convention broadens the scope of protection—from the seed to the products produced from the seed. For example, if a new soybean variety is developed in the United States, pirated by some means and brought to Canada, produced and shipped back into the United States, the holder of that property right could stop that product at the border and collect the royalty revenue on that production.

Canada's Plant Breeders Rights still have two significant exemptions which are very problematic to the industry—a research exemption and a farmers' exemption. The research exemption means other researchers can use your material to develop new products. The farmers' exemption allows farmers to plant their own seed on their own holdings. Many of the new players in our industry find these exemptions too onerous. So, Canadian breeders have moved to other forms of intellectual property protection, such as patents. Now contracts are used to plug the farmers' exemption—the ability to farm and plant back his own seed.

In summary, as a plan for the future, we need to engage the ministries of health and the environment in the WTO discussions because that is where the technical barriers will be negotiated. Ironically, there is another related technical barrier which runs parallel to that—the Food Quality Protection Act of 1996 in the United States. It is yet to be fully implemented, it is now in place. Basically, what it says is if there is detectable residue in any product produced, then the tolerance is zero. The problem is that Canada grows crops which are not grown in the United States. Canada has pesticides registered for use in producing those crops, on which there is no residue tolerance in the United States. If we ship a product and there is a detectable level of pesticides and the tolerance is zero, there is a technical barrier.

SPARKS COMPANIES INC.

Ron Gibson

The focus of my comments is primarily on the U.S. paper, but I will have some comments on the Canadian paper as well. At Sparks Companies, Inc., we project acreage and production. Our direction of expectations in terms of acreage fits very well with both papers. Looking at acreage in terms of world trends, we see a continuing dietary trend toward increased wheat, protein and vegetable oil consumption.

Our Canadian and U.S. acreage allocation projections indicate increased acreage of coarse grain production—corn in the United States and barley in Canada. Sparks also projects increased acreage of oilseeds—particularly, soybeans in the United States and canola in Canada.

Ten years of subsidy wars have distorted the quantity of wheat consumed in the world. Wheat priced at $90 per tonne results in buyers like the former Soviet Union and China consuming more than when prices are at $150 or $200. As a result, wheat coarse grains and oilseed complexes could lag over the next 10 or 15 years.

I was really interested in the impact of less government on the amount of price volatility. There is a school of thought that with less government involvement in managing prices, less volatility results. The argument against that point of view is that the market does a better job of managing stocks that the government does. I do not usually agree with that. In past years, the government was holding 8 billion bushels of wheat, oilseeds and feed grains. It is hard to imagine that we are going to have less price volatility with the stock levels which we have now. Presently, the market is not willing to pay for large stock levels.

A relatively small percentage increase in trade between Canada, the United States and Mexico is attributable to the North American Free Trade Agreement (NAFTA). One of the major events which caused the increased wheat trade was the Export Enhancement Program (EEP). It sucked Canadian grain into the United States.[1] There has been a legacy to that. Many U.S. millers got used to using a particular kind of Canadian wheat. They liked it and continued to use it even though the EEP, at least for the time being, has disappeared. Also, with the Canada-United States Trade Agreement (CUSTA), the Canadian Wheat Board believed that there was more political palatability to selling wheat to the United States.

[1]This was all happening when I worked for the Canadian Wheat Board.

On another point, the Anderson paper mentioned that there have been increased exports of oats and barley into the United States. That has occurred because of a shift in the United States away from oats and barley and into corn and soybeans. Those have been the two major growth areas for exports into the United States. These exports simply represent a filling of a void caused by the attractive returns in the United States on corn and soybeans.

Comments were made that CUSTA and NAFTA had created a more favorable investment environment for U.S. companies into the Canadian grain sector. I think that is probably true, but it has had very little impact on the decisions by ConAgra and ADM to come into Canada. The big reason is a global and definitely North American trend toward companies trying to get more integrated with their complete downstream operations. Companies like ConAgra, ADM and others are more interested in handling grain as a function of their downstream processing. They are not handling grain just for the sake of handling grain. While this explains why ConAgra and ADM came into Canada, it does not explain why Dreyfus came in—for which I am still perplexed. Dreyfus does not have domestic processing in either Canada or the United States. Perhaps this is a "follow the leader" phenomenon—everybody is investing in Western Canada so maybe we should as well.

The regulatory phenomena which has attracted U.S. companies to Canada is the rail incentive rates. For those of you who are unfamiliar with incentive rates, which started in the late-1980s, they are just lower rates if you can load more cars. That has a surprising impact. With incentive rates, a big company like ConAgra would have an advantage over a smaller company. That fits extremely well with their style of doing business in the United States. Incentive rates have attracted U.S. companies into Canada. Also, with the general impression that Canada is deregulating, there is an opportunity to enter.

I would like to address the notion of the impact of removing the Canadian Wheat Board and its impact on the flow of grain into the United States. I was happy to see recognition that pressure periodically develops for Canadian farmers to want to sell into the United States as a result of the difference between the spot versus pool price. In Canada, the farmers are looking at the pool returns for milling and durum wheat. In the United States, they are looking at spot market prices which go all over. It is when those prices get out of line that we see considerable pressure develop to sell in the United States. That situation is so often overlooked when trying to explain trade flows. It is appropriate that this point be made.

I was really intrigued with the argument that with the new volatility that we expected and have seen in the last couple of years, combined with reduced government involvement (less stock holding and subsidies), there is a fear of a backlash against free trade policies. I think that there are three flaws in that logic:

- As an economist, I do not think government has really demonstrated its ability to execute safety net programs very effectively.

- Even if we have decoupled programs, for which we assume the existence of safety nets, there are still trade-distorting impacts. For example, Europe, with its massive decoupled payments for cereal grain production have had production stimulating effects. We have seen major increases in European cereal production since the WTO.

- Agricultural production is not as large a percentage of the overall economy as it used to be. The traditional economic logic for safety nets does not exist anymore. As long as farmers believe we are going to bail them out, they will not use risk management tools and will not plan for their future capital needs.

I have a few quick comments on the Canadian paper. One of the major trade shifts which was mentioned was the loss of China as a huge wheat market for Canada. Sparks did a study that projected out ten years and we do not think that the loss of China is a short-term phenomenon. China has a national priority to be self-sufficient in wheat. We project that they will only be importing high-quality wheat, maybe 2 to 4 million tons per year, with the exception of the occasional drought.

The Canadian paper did not extensively cover what I believe to be the most impressive structural change in Western Canada—the rationalization of our elevator system. In Western Canada, there is a massive building program of new grain elevators. In addition to the elevators which have already been built, there are 60 new elevators which have yet to be constructed. These are all $10 to $20 million investments which represents about 25 percent more capacity than exists now. In terms of through-put, it is much more.

Right now, there are over 1,100 elevators in Western Canada. At Sparks, we project that there will soon be less than 500. I do not think that this is a direct result of CUSTA but, rather, it is a result of other factors such as incentive rates, Canada Transportation Act, low cost of money and the domino effect of investing.

THE NORTH AMERICAN LIVESTOCK INDUSTRY: A U.S. PERSPECTIVE

David P. Anderson, James Mintert, and Gary Brester

INTRODUCTION

Livestock and meat trade flows among North American countries have generated tensions over the last few years. In the cattle sector, falling cattle prices and producer profits from 1994-96 generated concerns as market participants questioned the impacts of trade liberalization on those prices. In the hog and pork sector, trade tensions have been less contentious and overshadowed by rapid structural changes. The growth of large integrated contract producers has been the focus of many industry concerns.

This paper examines the U.S. beef and pork production, processing, and consumer demand sectors by detailing industry structure, changes, and performance. Economic advantages are identified where possible for each industry. Similarities and differences between the U.S. and Canadian industries are presented.

THE U.S. CATTLE AND BEEF INDUSTRY

The United States has the fourth largest inventory of cattle and buffalo in the world (USDA,b), only exceeded by China, India, and Brazil. Although other countries have larger inventories, the United States leads the world in beef production. The infrastructure and knowledge which supports this industry provides a competitive advantage for supplying increasing world beef demand.

The initial beef production component in the U.S. is a cow/calf operation which maintains breeding herds and produces calves. Cow/calf production occurs in all 50 states. Texas is the largest cow/calf state with 5.4 million beef cows. The top 10 beef cow states are located primarily in the Plains and South. They include Texas, Missouri, Oklahoma, Nebraska, South Dakota, Montana, Kansas, Kentucky,

Tennessee, and Florida. In general, calves are weaned between 450 and 650 pounds and sold to stocker/backgrounding operations or directly to feedlots. Some cow-calf operators retain ownership of calves throughout the feeding stage.

Backgrounding or stocker operations include those which graze calves on rye grass winter pastures in the Southeast, winter wheat pastures in the Southern Plains, and other grass feeding programs in the West, Midwest, and Northern Plains. In these operations, calves are overwintered on a feed source to be sold at heavier weights in the spring. In some areas these "feeders" may be held into the summer to take advantage of additional spring and summer grasses. In these cases, feeders are then sold to feedlots as yearlings. Stocker/background programs represent a U.S. production advantage because they provide feeding alternatives which increase industry flexibility.

Feeder cattle, yearlings, and/or calves are eventually sold to feedlots which use concentrated (grain) feeding rations to produce slaughter weight steers and heifers. Virtually all slaughter steers and heifers are grain fed in the United States. The primary nonfed component of beef production are cull cows and bulls, the majority of which are used for production of ground beef. Feeding periods vary with respect to weather, breeds, and economic conditions, but can range from 100 to 240 days.

A 10-12 year cycle of U.S. cattle inventories has occurred regularly since before the turn of the century. The cycle is primarily the result of biological production timing and economic conditions. U.S. cattle inventories totaled 98.5 million head on January 1, 1998. This marked the second year of declining inventories following the last cycle peak of 103.5 million head in 1996. Prior to the 1980s, the long-term trend in the U.S. cattle sector was for cyclical inventories to increase. However, the cattle inventory peak during the 1979-90 cycle failed to exceed the previous cycle's peak, and the 1990 cattle inventory estimate marked the first time an inventory trough fell below the previous cycle's trough. This shift was one of many signals indicating that aggregate U.S. beef demand was not increasing as it had in the past.

Western States

Perhaps the most interesting and controversial area of cattle production in the U.S. occurs on western public lands (California, Oregon, Washington, Nevada, Idaho, Montana, Wyoming, Colorado, Utah, Arizona, and New Mexico). Large areas of these states are owned by the Federal government and are well suited for grazing livestock. These 11 public land states contain about 19 percent of the beef cows in the United States. Many ranches use combinations of public, private, and state grazing lands. Public lands are generally administered by the U.S. Forest Service, the Bureau of Land Management, the U.S. Department of Agriculture, and the Department of the Interior. Animal unit months (aums) of grazing totaled 16.8 million on Forest Service and Bureau of Land Management lands in 1990.

The first public land grazing fees were proposed in the 1870s, but were not enacted for 30 years (Foss, 1959). Since then, the level of grazing fees has been a controversial subject. Public land grazing fees are determined by a formula that considers the value of forage, cattle prices, and production cost inflation. Public grazing fees are controversial because they appear to be low relative to private lease rates. In recent years public grazing fees have ranged between $1.30 and $2.00 per aum whereas private lease rates have ranged between $4.00 and $13.00 per aum in Western states (USDA,d). Although public grazing lease rates are lower than private lease rates per aum, studies show that other costs (e.g., labor, water, death losses) are generally higher on public than private land, and that grazing quality and productivity of public lands are often lower than on private lands (Torell et al., 1993).

Public land leases are often tied to the land base of privately-owned ranches. Although such leases are not legally bound to private property, public land leases are often transferred with private ranches. Research suggests that the value of lower public lands grazing fees are capitalized into the value of private ranches (Torell and Doll, 1991). As a result, raising public land lease rates could cause a decline in the value of some ranches.

Various proposals to increase fees have been proposed. One study estimates the own-price elasticity of demand for public land grazing ranges from -0.10 to -0.42 implying that the quantity demanded of public land grazing is relatively unresponsive to fee increases (Anderson and Richardson, 1993). In addition to controversy surrounding grazing fees, environmental groups argue for reductions in public land grazing throughout the West. Availability of public grazing is likely to decline as riparian areas are fenced to protect fish habitats, and hunting and fishing enthusiasts promote the development of additional wildlife habitats. Differences between private and public land lease rates are expected to cause more controversy and division between producers and environmental groups and between public land ranchers and cattle producers in other parts of the country.

Feedlot Production

Historically, most cattle feeding was done by farmer-feeders in the Corn Belt. However, cattle feeding has migrated to specialized feedlots located in the Southern Plains. Farmer-feeders currently possess less than 5 percent of U.S. cattle feeding capacity. Relatively dry climates, plentiful feed supplies made possible by irrigation, and improved transportation technologies and infrastructures which allow less bulky, perishable meat products to be shipped to population centers have stimulated the migration of both cattle feeding and slaughtering to less-populated regions of the Plains.

Economies of size provided the motivation for the rapid consolidation of the feedlot industry that continues today. Feedlots larger than 32,000 head marketed 18.5 percent of the fed cattle in 1977. In 1997 feedlots the same size marketed 41 percent of fed cattle. Several key issues have driven consolidation and increased feedlot capacities. Economies gained by larger cattle feeding operations include full

utilization of feed mills, cost savings in volume purchases of feed, and both labor and marketing efficiencies. In addition, specialized feedlots are able to increase turnover rates (the number of cattle marketed relative to feedlot capacity). For example, farmer-feeders generally have a turnover rate of one, which means they feed one pen or set of cattle each year. Specialized feedlots may have turnover rates of 2.5 or more which spreads fixed costs over more cattle, thereby leading to lower production costs.

THE CANADIAN CATTLE AND BEEF INDUSTRY

The Canadian cattle sector is much smaller that of the United States. For example, Canadian cattle inventories totaled 13.2 million head in 1998 which represents only 13 percent of U.S. inventories. Cattle inventories are in their second year of decline after peaking at 13.4 million head in 1996. However, total cattle inventories have increased since the early 1980s, whereas U.S. cattle inventories peaked in 1975. Cattle feeding in the Western provinces expanded throughout the 1990s, while total cattle inventories were declining in the Eastern provinces.

Alberta's cattle feeding industry has expanded rapidly in recent years because of good access to feeder cattle supplies, a relatively dry climate, low population densities, and declining feed costs. Currently, the size of Alberta's cattle feeding industry trails just three U.S. states. The driving force in the expansion of cattle feeding in the Western provinces has been declining feed grain prices. The Canadian Plains produce large quantities of barley and wheat. The removal of federal transportation subsidies to port markets reduced grain prices in the interior of the country and caused producers to look for alternative market outlets, such as cattle and hog production. Concurrently, feed supplies were further boosted when adverse weather damaged the quality of the 1992-93 wheat crop resulting in a sharp increase in feed wheat (Alston, Gray, and Sumner, 1996). The supply of feed wheat further increased the following year because of unusually wet growing conditions.

The Canadian cattle feeding industry appears to have fewer backgrounding opportunities relative to the United States and, therefore, tends to place calves in feedlots at relatively lighter weights. This observation is supported by live cattle export data which indicate most Canadian slaughter cattle are exported to the United States during the first portion of each year. These marketings are consistent with feeding periods necessary to feed calves that have not been backgrounded, given traditional calving seasons. Thus, the Canadian feeding industry may be less flexible than the United States sector in terms of responding to market signals. Backgrounding opportunities may provide the United States with cost of gain competitive advantages during periods of high feed grain prices. It also provides the opportunity for a smoother flow of feeder cattle placements throughout the year.

The types of cattle produced in the United States and Canada are somewhat different. Anecdotal evidence indicates that the Canadian industry has a relatively higher percentage of Continental breeds (e.g., Charolais) than the United States. Perhaps because of the Continental breeds prevalence, grading data indicate that a

lower percentage of Canadian cattle grade AAA (approximately equivalent to U.S. Choice) than in the U.S (Alberta Cattle Feeders). But Canadian cattle may produce more consistent carcasses than U.S. cattle because of the reliance on Continental breeds. The apparent differences in grading characteristics of Canadian and U.S. cattle suggest there is an opportunity for market segmentation and specialization which could lead to greater reliance on U.S. cattle for higher quality table cut beef and more reliance on Canadian cattle for carcasses capable of grading Select in the U.S.

THE MEXICAN CATTLE INDUSTRY

Total Mexican cattle inventories (including dairy and dual purpose animals) are approximately one-third the size of U.S. inventories. The United States and Mexico have a long history of cattle movements between the two countries. In general, light weight calves are exported to the United States for placement in backgrounding and feedlot operations. Over the last 10 years, Mexico's annual exports averaged approximately one million head. However, 1.65 million head were exported in 1995. The increase during 1995 was primarily caused by two factors. First, Mexico's economic crisis resulted in a devaluation of the peso and large increases in interest and inflation rates. Mexican cattle producers responded by selling larger numbers of feeder cattle and cows in the United States. Second, a severe multi-year drought in northern Mexico, which peaked in late 1994 and early 1995, also encouraged producers to export more calves to the United States. Nonetheless, increased exports generated concerns among U.S. cow/calf producers, particularly in the Southwest. These concerns were further exacerbated by uncertainties regarding the impact of the recently enacted North American Free Trade Agreement (NAFTA). Although some argued that much of the decline in U.S. feeder cattle prices was attributable to NAFTA, research suggests that only a small portion of the decline (ranging from -$0.32 to -$1.03 per cwt for 400-500 pound steers) was caused by increased cattle exports from Mexico (Peel and Cockerham, 1995). The aggregate impact of the larger feeder cattle imports was muted by the fact that, in the short run, cattle feeders benefited from the modest reduction in feeder cattle prices attributable to the import increase.

Mexican cattle exports to the United States have declined dramatically since 1995. In 1996, Mexican cattle exports to the United States were only 456,246 head, a 72 percent decline from 1995 and the smallest level since 1984. But during 1997, cattle imports from Mexico rebounded to 669,409 head, a one year increase of 47 percent. Long term, cattle imports from Mexico to the United States are likely to stabilize somewhere between the 1997 level and the long term historic average of 1 million head.

U.S. beef exports to Mexico are expected to grow over time, but will remain sensitive to Mexican economic conditions. After experiencing a sharp decline during 1995 as a result of economic upheaval in Mexico, U.S. beef exports rebounded in 1996 and 1997. U.S. beef exports to Mexico during 1997 reached 312 million pounds, an increase of 239 percent since 1995. Moreover, when converted to a liveweight equivalent, 1997 U.S. beef exports to Mexico were equivalent to 445,000 head of slaughter

cattle. Long term, the relative size of cattle and beef trade will depend upon economic conditions in Mexico. Since the United States has a comparative advantage in grain fed beef production, Mexico is expected to continue shipping feeder cattle north for feeding and processing, and the United States will likely increase boxed beef exports to Mexico over time.

THE BEEF PACKING SECTOR

The beef packing industry has experienced considerable consolidation over the past two decades, primarily the result of companies implementing low-cost processing strategies through the capture of economies of size. Moreover, beef slaughtering and processing companies are increasingly global in nature. For example, IBP and Excel maintain packing facilities in the United States and Canada. These plants not only supply Canadian domestic and foreign trade needs, but also provide flexibility in terms of supplying carcass beef to processing plants in the United States. Given this environment, relative changes in processing costs (e.g., regulatory differences) could result in either U.S. cattle moving from Western states for slaughter in Canada or Canadian cattle moving from Western provinces into the United States.

U.S./CANADIAN CATTLE AND BEEF ISSUES

Quality and Pricing Issues

Beef slaughtering/processing plants must operate near design capacities to minimize slaughter and processing cost per head. Consequently, it becomes relatively more important to focus on maintaining a constant volume of slaughter cattle relative to seeking higher quality slaughter cattle. Although pens of cattle which are suspected to contain a higher percentage of animals grading Choice attract higher prices, the price differentials are small and economically insignificant from a cattle feeders perspective (Jones et al., 1992). Furthermore, it is unclear whether subjective quality evaluations of live cattle based upon visual inspections are correlated with the quality of end-products produced by those cattle. Thus, live weight cash market pricing creates little incentive for cow/calf producers, backgrounders, or feedlots to improve cattle quality. One attempt to solve the quality issue is the movement toward value-based marketing in the form of pricing grids. Pricing grids establish premiums and discounts based upon end-product quality characteristics. Further adoption of such systems should provide pricing signals that increase incentives for improving quality.

The 1995 Beef Quality Audit (Smith et al., 1995) recognized five major beef quality concerns. They were:

- low uniformity and consistency;
- low palatability;
- low tenderness;
- too much external fat; and
- too high a price for value received.

These concerns strongly indicate that cattle prices must be tied more closely to end-product quality characteristics (Schroeder et al., 1998). Until value-based marketing systems are widely adopted, the quality of U.S. beef is likely to continue to be relatively variable. Whereas quality consistency is a U.S. disadvantage, it appears to be an advantage for Canadian beef. Canada's heavier reliance on Continental breeds which perform well in colder climates has contributed to a more uniform, consistent product—although the average quality of Canadian beef may be slightly lower than that of the United States.

The sharp decline in cattle and calf prices in 1994-96 ignited debate regarding the effects of beef packing concentration (market power) and captive supplies on cattle prices. In 1980, the four-firm concentration in the beef packing sector was 36 percent of steer and heifer slaughter, but increased to 82 percent by 1994 (USDA, c). Many cattle producers believe that concentration in the beef packing sector allows packers to reduce slaughter cattle prices through the use of market power. However, most research on this topic indicates that, although packers have been able to exercise some market power, it has had a very small impact on prices received by producers (Ward and Schroeder, 1996). But, concentration has also led to increased plant and industry efficiencies that may allow packers to bid more for cattle than would otherwise be the case (Azzam and Schroeter, 1995).

Captive supplies refer to cattle which are either contractually committed to packers more than two weeks in advance, or are directly owned by packers. The impact of captive supplies on the market price of cattle is unclear. On one hand, a packer with large captive supplies may be likely to bid less aggressively for additional cattle which could lower prices. On the other hand, captive supplies reduce the number of cattle available to other packers which may have a positive influence on cattle prices. Research has shown that in some cases, captive supplies have a negative impact on cash cattle prices, but the impact is very small (Ward, Schroeder, Barkley and Koontz, 1996).

Packer concentration will remain high in the future. Firms which operate packing plants in both the United States and Canada will allow for increased coordination of cattle supplies between the two countries. Emphasis will likely remain on running plants efficiently to keep slaughter and processing costs per head low. Greater use of grid pricing and marketing alliances in the cattle sector should lead to greater emphasis on producing cattle with desirable quality traits.

Environmental Regulations and Costs

The 1972 Clean Water Act designates feedlots with greater than 1,000 head capacities as point sources of pollution and requires that manure management processes follow National Pollution Discharge Elimination System (NPDES) rules (Outlaw, et al., 1993). This designation results in significant costs and levels of management required to maintain a NPDES permit. NPDES permits require that feedlots have a pollution prevention plan that includes a retention facility or basin designed to capture and hold all contaminated runoff and process water for a minimum of

21 days, a waste management plan, an erosion control plan, an employee training plan, a regular inspection program, and a record keeping system. In addition, any existing retention facility must be certified by a professional engineer or ground water scientist as having no hydrologic connection to nearby waterways (Smolen and Caldwell, 1993).

Feedlots with fewer than 1,000 head capacities are designated as nonpoint sources of pollution. In general, the waste management options available to this type operation are less costly and management intensive. According to Sweeten and Melvin (1985), best management practices (BMPs) that could be utilized by smaller feedlots include:

- locating feeding facilities away from streams or drainage channels;
- diverting outside runoff away from feedlot surfaces using diversion terraces and roof gutters;
- collecting solids contained in feedlot surface water runoff;
- installing grass filter strips which are at least twice as large as the feedlot if the feedlot is located near a body of water; and
- installing a runoff holding pond if the water quality risk is high.

Unconfined cattle production is also treated as a nonpoint source of pollution. This type of production accounts for one-half of the almost 109 million metric tons of animal manure generated each year in the United States (Sweeten and Melvin, 1985). In unconfined livestock operations, manure and sediment runoff can be significant, particularly where livestock are free to graze along streams and ponds (EPA). BMPs that help control pollution from these sources include:

- installing electric wire fences along streams and providing environmentally sound stream crossings;
- rotating cattle among several smaller-sized loafing areas to allow vegetative cover to regenerate;
- providing adequate storage for manure supplies; and
- applying manure nutrients to land only as needed by crops.

The current U.S. administration is proposing new, stringent water pollution regulations. It appears that these regulations will classify additional livestock operations as point source polluters. Some indications of future policy point toward zero discharge rules similar to other industries. Although such actions will certainly impose additional costs on livestock industries, it will also provide additional incentives to construct livestock facilities in relatively arid regions.

Feed Availability and Costs

The 1996 farm bill eliminated many feed grain policy instruments. The elimination of acreage bases will increase both feed grain production and crop selection flexibility. Both events will increase feed grain supplies, lower associated prices, and reduce livestock feeding costs. Initial evidence indicates that feed grain acreage may increase in the Southeast—which is nearer pork and poultry production regions.

Food Safety

No single issue may be of more long term importance to the meat industry (especially the beef sector) than food safety. Increased scrutiny of the safety of the U.S. food supply has followed in the wake of recent food-borne illness outbreaks (e.g., E. coli 0157:H7 outbreaks in the Pacific Northwest in 1993 and Hudson Foods in 1997) and the recent, well-publicized agricultural products libel suit initiated by Texas cattle producers. The response of the meat industry to food safety issues will be critical for maintaining market share of consumer food expenditures.

Until recently, U.S. meat inspection procedures used by USDA's Food Safety and Inspection Service (FSIS) had changed little since their inception in the early 1900s. Inspection procedures were primarily based on organoleptic (sight, smell, and feel) approaches for detecting unsafe carcasses. These methods have been criticized as inadequate to identify and control food-borne pathogens, chemical contaminants and other potential hazards on individual carcasses. On July 6, 1996, FSIS released the final ruling on the Pathogen Reduction, Hazard Analysis, Critical Control Point (HACCP) Systems regulation. The regulation represents the most significant change in the meat inspection system since its inception. HACCP involves the identification of hazards and critical control points in the production process where hazards can be reliably monitored and controlled, and the implementation of outcome-based verification systems to ensure that controls are effective (Crutchfield et al., 1997). All U.S. meat and poultry plants are required to develop HACCP plans in addition to existing regulations.

In addition to new HACCP regulations, interest in developing "traceback" programs has been increasing. Traceback programs provide for identification and monitoring of individual animals from the cow/calf level through the slaughtering process. The goal of traceback is to identify, reduce, and eliminate pathogen contamination throughout the marketing system by locating and correcting problems before they can spread through the processing sector. Traceback is a controversial subject with producers in the United States. Many see it as an additional regulation which may not significantly improve the safety of meat products. Anecdotally, it appears Canadian producers may be approaching traceback more optimistically than their U.S. counterparts. For example, the Alberta Cattle Feeders have reacted favorably to traceback proposals, if they help ensure product quality.

Status of Beef and Cattle Trade Between the U.S. and Canada

Beef and cattle trade between the United States and Canada has been dramatically influenced by two watershed events—the 1989 Canada-U.S. Free Trade Agreement (CUSTA) and the elimination of grain transportation subsidies in Canada. The CUSTA eliminated tariffs on live cattle and beef products and eliminated quota restrictions between the two countries. Consequently, live cattle imports from Canada (primarily from Alberta) have increased more than threefold since 1989. Elimination of grain transportation subsidies has resulted in increased feed availability and lower feed grain prices in the western Canadian Plains.

Following adoption of the CUSTA, both Excel and IBP purchased and expanded slaughter capacities in Alberta. The investments are the result of expected increases in cattle feeding in the area, and the potential markets represented by the Pacific Rim for which transportation advantages are available. However, U.S. midwest beef packers have a locational advantage to eastern Canadian beef markets relative to western Canada's packing industry. Trade between the United States and Canada has been manifested by increases in live cattle movements from Canada to the United States in the West, and increases in boxed beef trade from the United States to Canada in the East. Thus, the CUSTA and elimination of grain transportation subsidies have allowed for a more efficient use of transportation and feeding resources.

Historically, the United States imported significant quantities of feeder and slaughter cattle from Canada. In 1987, the United States imported 244,710 head which increased to 1.5 million head by 1996 before dropping back to 1.4 million head in 1997. The United States exports only minor amounts of live cattle to Canada. For example, in 1997 U.S. cattle exports to Canada totaled just 41,189 head. Nonetheless, this situation is expected to change as increased Canadian cattle feeding and slaughtering could lead to smaller cattle exports from Canada to the United States and might even lead to some increases in feeder cattle exports from the United States to Canada.

Issues Inhibiting U.S.-Canadian Beef Trade

Canada and the United States lack reciprocal grading standards (Hayes, Hayenga, and Melton, 1996). Thus, Canadian boxed beef is sold in the United States as ungraded or “no roll” beef which is often sold at a substantial price discount to Choice beef. However, the problem is partially circumvented by the export of Canadian beef carcasses to the United States where they receive USDA grades and are subsequently sold as boxed beef. Nonetheless, it would be more efficient to export Canadian boxed beef rather than beef carcasses. Likewise, U.S. boxed beef is sold in Canada at “ungraded” beef discounts.

Sanitary and phytosanitary regulations have historically increased costs of trading live cattle between the two countries. For example, U.S. Federal and State regulations require that cattle imported from Canada be tested for brucellosis and tuberculosis. Canada requires tests for amaplasmosis, brucellosis, and tuberculosis

for live cattle imports from the United States Both the North American Free Trade Agreement (NAFTA) and the GATT/Uruguay Round trade agreements specify that sanitary regulations must be based on science and that procedures used for risk assessment must meet internationally accepted standards. Therefore, it is possible for sanitary restrictions to be waived if animals are sourced from areas which are known to be disease-free.

Expected Impacts of Further Reducing Trade Barriers

Although the western Canadian cattle feeding industry has a slight cost advantage over the United States, the lack of grading equivalency forces Excel and IBP to export carcasses (rather than boxed beef) to the United States. The net effect is an increase in the effective cost of beef processing in Canada. Unifying grading standards would, in general, reduce slaughtering/processing/distribution costs in North America and lead to larger trade flows between the United States and Canada. In general, larger volumes of higher quality beef from the United States would likely be shipped to Canada whereas larger volumes of Select grade beef would likely be shipped from Canada to the United States. Long term, if Canadian slaughtering and processing costs are competitive with the United States, slaughter and feeder cattle exports from Canada to the United States could decline as a greater proportion of the cattle are slaughtered and processed in Canada and boxed beef is exported.

The Montana Pilot Project

Montana's cattle industry consists primarily of feeder cattle production. Feeder cattle are generally exported to midwest cattle feeding regions. However, increased cattle feeding in Alberta presents a viable alternative marketing outlet for Montana feeder cattle. Thus, the Montana Pilot Project seeks to reduce unnecessary sanitary trade barriers (those which cannot be justified by science) and lower trading transactions costs (Young and Marsh, 1997). Under the pilot project, the U.S. Animal and Plant Health Inspection Service would waive Federal test requirements for brucellosis and tuberculosis for Canadian cattle entering Montana. The State of Montana would also eliminate requirements that imported cattle be vaccinated for brucellosis. Neither disease exists in these two regions. However, the tests must be performed on Canadian cattle which are subsequently moved to other States. Canada will place cattle imported from Montana into special feedlots while waiving required tests for anaplasomsis, brucellosis, and tuberculosis. Such tests generally cost $25/head. These cattle must be kept separate from others and sold only to packers. The Montana pilot project indicates an opportunity exists to market some U.S. feeder cattle from northern Plains and Mountain states to feedlots in the Canadian Prairie, if sanitary trade barriers decline.

Driving Forces in U.S./Canadian Beef and Cattle Trade

Several driving forces with respect to U.S./Canadian beef and cattle trade have emerged:

- elimination of grain transportation subsidies has increased cattle feeding activity in Western Canada and provided cost advantages;
- trade liberalization represented by CUSTA, NAFTA, and GATT has increased trade between the United States and Canada as well as Pacific Rim countries;
- expanded slaughtering capacity in Western Canada will further boost cattle feeding in the region and may reduce feeder cattle exports from Canada to the United States and, possibly, increase feeder cattle exports from United States to Canada; and
- competition between United States and Canadian beef for export market shares could increase.

Efforts to reduce unnecessary sanitary and phytosanitary regulations and unify grading standards between the U.S. and Canada could improve efficiency of the North American beef industry.

Exchange Rates

Perhaps one of the most interesting changes in the U.S.-Canada livestock dynamics is exchange rates. The Canadian dollar weakened considerably versus the U.S. dollar in the early to mid 1990s. The exchange rate declined from US$0.85/Canadian$ in 1990 to US$0.72 by 1996. The sharp decline in the Canadian dollar's value in 1992 and 1993 encouraged increased cattle movements to the United States and growth in the Canadian cattle feeding industry.

CATTLE AND BEEF SUMMARY

In many ways the cattle industries in Canada and the United States are similar. The two countries are the world's major suppliers of grain fed beef. Exports are very important to Canada, and are gaining importance for the United States. Both countries see trade as a way to boost sales in response to declining or stagnant domestic demand and are relying on income growth in Asia to foster export growth. Food safety concerns are becoming more important to consumers in the United States, Canada, and importing countries.

Major changes in the location of beef production are not expected. U.S. cow-calf production in some western states may decline if environmental groups opposed to grazing on public lands are successful in substantially raising lease rates or reducing stocking numbers, but the overall impact on the industry may be negligible. U.S. cattle feeding will continue to be concentrated in the Plains states as farmer-feeders continue to exit the industry. Cattle feeding in the Canadian Prairie provinces will continue to grow, primarily because of feed cost advantages. Long term, boxed beef exports from Canada to the United States could grow if Canadian slaughtering/processing costs are competitive with the United States and U.S./Canadian grading standards are unified.

THE U.S. HOG AND PORK INDUSTRY

Worldwide pork production increased 128 percent from 1975 to 1996. Pork production in China, the world's largest pork producer, accounted for over one-half of world pork production in 1996 and increased 450 percent from 1975. Large production gains were also realized in the United States, Canada, the European Union (EU), and Taiwan. Only in the Former Soviet Union (FSU) did pork production decline during this period. The United States is the world's third largest pork producer (following China and the EU). Although world pork production is larger than for any other species, quantities of pork traded worldwide are less than 50 percent of world beef and poultry trade. Nonetheless, world pork trade has slowly trended upward from 1.8 million metric tons in 1990 to 2.3 million metric tons in 1996. The 1996 level represents just 2 percent of world production.

The United States became the third largest pork exporter in the 1990s. The United States share of world pork trade grew significantly during the 1990s, rising from just 6 percent in 1990 to 19 percent in 1996. Historically, major U.S. markets included Japan, Canada, and Mexico. However, since 1994, FSU has emerged as the second largest importer of U.S. pork (following Japan). Japan accounts for more than one-third of world pork imports, and is the largest market for the U.S. pork industry. Canada is the world's fourth largest pork exporter. In contrast to the United States, Canada's share of world pork trade actually declined modestly during the 1990s, falling from 14 percent in 1990 to 12 percent in 1996.

United States per capita pork consumption has experienced some variability over the past two decades, but no discernible long term trend. Per capita consumption averaged 52 pounds (retail weight) during the 1980s, and just over 51 pounds during the 1990s. Although real U.S. retail pork prices varied over this period, they trended downward as prices in the 1990s averaged 10 percent less than in the 1980s.

U.S. Hog and Pork Production Trends

Hog slaughter and pork production in the United States have both trended up since the mid-1980s. Commercial hog slaughter in the United States during 1986 totaled 79.6 million head. By 1997, U.S. hog slaughter had climbed to nearly 92 million head, an increase of 16 percent over the 1986 level. Furthermore, growth accelerated sharply during 1997 and, as a result, U.S. commercial hog slaughter during 1998 is expected to establish a new record, ranging from 99 to 99.5 million head. At the end of 1998, U.S. hog slaughter will have exceeded 95 million head for just the fourth time in history with three of those four years occurring in the 1990s.

U.S. pork production has been growing for a longer period of time than hog slaughter because of increases in average dressed carcass weights. Annual U.S. pork production has been increasing consistently since a brief production downturn in the mid-1970s. Commercial pork production in the U.S. totaled 11.3 billion pounds in 1975 and 17.2 billion pounds in 1997, an increase of 52 percent. Fifty-five percent of

the production increase occurred from 1986 through 1997. A large increase in hog slaughter is expected to push 1998 pork production up to a range of 18.8 to 19 billion pounds, a one year increase of 9 percent and 66 percent above the 1975 level.

Pork production increases have resulted from the industry's transition towards slaughtering hogs at heavier weights, in addition to the hog slaughter increases. From 1975 to 1997, when U.S. hog slaughter increased by 34 percent, pork production increased 52 percent. The difference was attributable to slaughtering hogs at heavier weights. Carcass weights in the United States averaged 165 pounds in 1975. By 1997, carcass weights rose to an average of 187 pounds. From 1975 through 1997, carcass weights increased at an average rate of 0.5 percent per year. The trend toward slaughtering hogs at heavier weights is attributable to improved genetics, which allows producers to feed hogs to heavier weights without fat levels rising to unacceptable levels, and packers recognition that slaughter costs for heavier hogs (per head) are virtually the same as for lighter hogs. This means slaughter costs per hundredweight of pork produced are lower for heavier hogs. Prices paid by U.S. packers to hog producers increasingly reflect their desire for heavier hogs that are also lean. U.S. hog producers are responding to packers' price signals by marketing hogs at heavier weights.

U.S. Hog Sector Productivity

Productivity growth has had a big impact on the U.S. pork production sector. One way to estimate the U.S. pork sector's aggregate productivity change is to examine the change in the breeding herd's size relative to changes in hog slaughter and pork production. For example, the U.S. hog breeding herd in 1975 averaged 7.5 million head. By 1997, the breeding herd averaged just 7 million head, despite a 34 percent increase in hog slaughter over the period. Improvements in technology and management from 1975 through 1997 produced steady increases in the number of pigs per litter (up 20 percent), the number of hogs slaughtered per sow in the breeding herd (up 43 percent) and pork produced per sow in the breeding herd (up 63 percent). The productivity increases have allowed for increases in pork production without concurrent increases in the breeding herd. Pork production per sow has been increasing at about twice the rate of dressed beef production per cow. Differences in aggregate productivity measures between the two red meat sectors suggest consumers will ultimately experience a decline in the pork/beef price ratio, which could lead to pork gaining market share at the expense of the beef sector. The U.S. (and Canadian) pork industries may be poised for future pork productivity increases (Brester, Schroeder, and Mintert, 1997) which could significantly reduce real U.S. retail pork prices (and Canadian prices as well) and thereby encourage greater domestic consumption. However, given that both the U.S. and Canadian markets are relatively mature, neither appears to be poised for tremendous growth. If world pork trade continues to grow, it is likely that export demand for U.S. and Canadian pork will play a major role in any future expansion of the North American pork industry.

Number of U.S. Hog Farms Declining

The major story in the U.S. hog sector continues to be increasing consolidation of production units. The long term decline in the number of hog farms is nothing short of astounding. Rhodes (1995) points out that, in 1940, there were 3,768,000 hog production operations in the U.S. By 1980 the number of firms declined to 674,800 and, by the end of 1997, the number of hog producers had dwindled to just 138,690, a decline of 79 percent in less than two decades. Not surprisingly, the remaining firms are growing in size. USDA data, which likely understates commercial hog farms' size increases because of the inclusion of very small hog operations, indicates the average number of marketings per operation more than tripled during this time frame. Growth of very large firms has been rapid during the last two decades. Rhodes indicates that so few firms marketed over 50,000 head in 1974, that they were considered anomalies. By 1993, firms in this size category were marketing 13 percent of live hogs in the U.S.

The move towards increasing firm size appears to have been driven by several factors. Rhodes indicates that the transition from firms producing hogs at a single site to producing hogs at many sites played an important role. Effectively, it meant that firm size was no longer limited to the number of hogs that could be situated at a single location. In turn, removal of this impediment to firm growth helped attract capital to an industry that, historically, produced above average investment returns for well managed firms. The introduction of new technology and improved management techniques also made it possible for single firms to efficiently manage much larger single and multi-site hog operations. And, in many cases, multi-site firms employ contract production as a means to expand total firm size quickly without commensurate capital investments.

Location of U.S. Hog Production

The location of hog production in the United States has also changed. The North Central region long dominated U.S. hog production. In the mid-1960s, three-fourths of the U.S. hogs and pigs inventory was located on hog farms in this region. Despite significant growth in hog production in other parts of the U.S., more than 75 percent of all hogs in the United States were still on farms in this region in the early 1990s. However, in the mid-1990s the North Central states were clearly losing market share and, by 1996, the North Central region's market share fell to just 67 percent of all hogs in the U.S. By far the biggest gain in market share took place in North Carolina, whose share of the U.S. hog inventory rose from 2 percent in the mid-1960s to 17 percent in 1996.

On a state basis, Iowa's share of U.S. hog inventories declined from 25 percent in 1965 to 21 percent in 1996 and Illinois' share fell from 13 percent to 8 percent in the same period. Although dramatic growth occurred during the early 1990s (in percentage terms) in states such as Oklahoma and Colorado that, historically, have been

minor pork producers, their share of the U.S. hog inventory is still modest. For example, Oklahoma's market share increased from less than 1 percent in the mid-1960s to 2 percent in 1996 and 3 percent in 1997.

Whether or not the North Central region is destined to lose additional market share is unclear. The most recent USDA hog inventory estimates indicate that Iowa, Illinois and Minnesota all experienced market share gains in 1997 (USDA, a). Several other North Central states also exhibited modest market share growth during 1997. As a result, market share for the North Central region as a whole grew from 67 percent in 1996 to 76 percent in 1997. Research indicates there are significant economies of size in hog production (Boehlje et. al., 1995). Whether or not North Central states gain or lose market share could hinge on their ability to increase firm size such that new technology can be adopted efficiently. Failure to do so will mean hog production will gravitate towards regions where producers adopt low cost technology.

Environmental concerns and a desire to move production sites towards less populated regions have encouraged some firms to locate slaughter plants and production facilities in the Southern Plains and the Mountain States. Examples include Seaboard's decision to locate a new slaughter plant at Guymon, Oklahoma with production facilities located in several nearby counties, and Circle Four's decision to locate in southern Utah. Despite the lower population density in the Southern Plains compared to both North Central states and North Carolina, several firms have found it difficult to gain local approval for new construction because of the opposition of local residents. Long term, it appears the Southern Plains region is well positioned to gain hog production market share as more populated regions with higher annual rainfall totals lose market share.

In response to concerns expressed by citizens and environmental groups, several states have either legislated, or are discussing, moratoriums on new facility construction. Discussions about changing environmental standards are taking place at both state and federal levels. Clearly new facilities and, possibly, existing facilities will face a much more stringent set of environmental standards in the future. The adoption of new environmental standards will certainly increase future production costs for the hog industry.

U.S. Hog Slaughtering Industry

Hogs in the United States are primarily slaughtered in Iowa, Minnesota, South Dakota, Nebraska and Missouri, in the Western Corn Belt; Illinois and Indiana, in the Eastern Corn Belt; and North Carolina and Virginia, in the East. Collectively, these nine states slaughtered 82 percent of U.S. hogs during 1997. As recently as 1994, 33 percent of U.S. hog slaughter took place in Iowa. By 1997 Iowa's share of hog slaughter declined to 26 percent. Concurrently, North Carolina's share of hog slaughter rose from 7 to 10 percent. Oklahoma's market share rose from less than 1 percent in 1995 to 3.5 percent in 1997, as a result of Seaboard's Guymon, Oklahoma plant coming on line.

Concentration in the hog slaughter sector has been increasing over time. In the early 1980s, the four largest packers were responsible for approximately one-third of U.S. hog slaughter. By the early 1990s, the four-firm concentration ratio was 44 percent. Mergers and acquisitions led to another increase in the four-firm concentration level by 1996, as the four largest firms' hog slaughter market share rose to 56 percent.

Future Location of U.S. Pork Plants

Most of the packing plants in the North Central states have been in operation for a long time. New plant construction has occurred primarily outside the North Central states. Seaboard constructed a new facility in Guymon, Oklahoma and is considering construction of another plant in the Southern Plains. Smithfield expanded their large Bladen county plant in North Carolina. If hog production continues to grow outside the North Central states, construction of new pork slaughter/processing facilities will likely follow.

THE CANADIAN HOG AND PORK INDUSTRY

Canada's pork production sector is about one-fifth the size of the U.S. pork industry. However, the Canadian hog sector has also been growing in recent years. Total hog marketings in Canada grew from 15.4 million head in 1991 to 18.1 million in 1996. Like the United States, the number of Canadian farms with a hog enterprise has been declining over time. From 1971 through 1996, the number of Canadian hog farms declined from 122,481 to 21,105, a decline of 83 percent. The average inventory per farm increased nearly 700 percent over the period. According to Srivastava and Bamford (1998), single-site, farrow-to-finish hog farms still dominate Canadian hog production. The average farm size is near 250 sows, but 1200 sow units are becoming commonplace and even larger units are being built in some locales.

Canadian per capita pork consumption has been relatively flat since 1985. For example, per capita consumption averaged 48 pounds during the 1985-89 period, and 47 pounds from 1990-96. Real Canadian retail prices have trended downward over the same period. Given that real per capita income increased in Canada (and the United States) over this period, it appears that U.S. and Canadian consumers' demand for pork is relatively weak. This is not surprising given the maturity of the pork market.

Canadian Hog Production

Over one-half (55 percent) of Canadian hog marketings in 1996 were produced in the Central provinces of Ontario and Quebec. Approximately 40 percent of Canada's hogs were produced in the Prairie provinces of Alberta, Manitoba and Saskatchewan. Although the share of Canadian hog marketings produced by the eastern Canadian provinces and the Prairie provinces did not change appreciably from 1991 to 1996, elimination of grain transport subsidies effectively lowered feed costs in the Prairies. The Prairie provinces' feed cost advantage, relatively arid

environment, and low population densities, suggests that production could expand, resulting in a shift in their Canadian market share and, possibly, their market share of North American hog production.

Canadian Hog Slaughter Industry

The number of Canadian hog slaughtering and processing plants has been declining and individual plant capacities have been increasing. However, Canadian plants are generally smaller than U.S. plants. For example, Canada has only 14 plants with slaughter capacity exceeding 10,000 head per week and only one plant which exceeds 30,000 head per week. The reduction in the number of plants and increasing capacity of the remaining plants means Canada's hog slaughtering industry, like the U.S. slaughter sector, is becoming more concentrated. The three largest Canadian hog slaughtering firms account for 47 percent of all Canadian hog slaughter.

In recent years, approximately 60 percent of Canada's hog slaughter occurred in Ontario and Quebec, and one-third of Canadian hog slaughter took place in the Prairie provinces of Manitoba, Saskatchewan, and Alberta. From 1991 through 1995, Quebec provided 34 and Ontario 26 percent of Canadian hog slaughter, respectively. But this pattern changed in 1996 and 1997 when Ontario's share dropped to 20 percent and Quebec's share rose to 41 percent, partly because of a lengthy strike at one of Maple Leaf Foods' plants located in Ontario.

Research by Martin, Ball and Alexiou (1997) indicates that a high cost structure has inhibited growth in the Canadian slaughter/processing sector. Small plant sizes, single (instead of double) shift operation of plants, slaughter weights below those of the United States, and higher wage rates all combine to push Canadian slaughter and processing costs well above costs of their U.S. based counterparts. The magnitude of the cost differentials (estimated by Martin, Ball, and Alexiou and further interpreted here) could exceed $6/cwt. (live weight, U.S. dollars). Nonetheless, several major packing companies have recently expanded their slaughter capacities which will likely reduce per head slaughtering costs.

U.S. AND CANADIAN HOG AND PORK TRADE

Increased Canadian hog marketings were accompanied by a dramatic increase in live hog exports to the United States From 1991 through 1997, Canadian hog exports to the U.S. grew from 1.1 to 3.2 million head. Canadian live hog exports to the U.S. totaled 15 percent of Canadian hog marketings in 1996. In essence, 64 percent of the increase in Canadian hog marketings from 1991 to 1996 were exported to the United States. Live hog imports from Canada averaged 0.9 percent of United States commercial hog slaughter from 1991 through 1994. But the relative importance of total live hog imports from Canada increased rapidly, equaling 1.8, 3.0, and 3.5 percent in 1995, 1996, and 1997, respectively, of U.S. commercial hog slaughter. Parenthetically, 31 percent of Canada's 1997 live hog exports to the United States

were feeder pigs, which were subsequently fed to slaughter weight in the United States, and the remainder were slaughter hogs shipped directly to U.S. packers.

Until recently, Canadian hog producers were required to use provincial hog marketing boards acting as single-desk sellers. The boards are producer controlled and financed by per head levies on all hogs sold (the levies vary from $1.25 to $3.25 per head depending upon the province). The majority of hogs are sold using formula prices linked to U.S. midwest hog prices adjusted by exchange rates and transportation costs. The boards generally pool prices on a weekly basis, receive payments from packers, and distribute payments to producers. In addition, many boards provide assembly, transportation, insurance, and market information services to producers. Recently, marketing boards in Manitoba, Saskatchewan and Alberta have lost their monopoly power over hog marketings. Some provinces have retained marketing boards, but producers in the three Prairie provinces have the flexibility to sell hogs directly to slaughtering plants.

The increase in producers marketing flexibility appears to be one reason why Canadian live hog exports to the U.S. have been growing. Differences in prices received by hog producers in the United States and Canada are large and likely explain most of the growth in live hog shipments to the United States (although a work stoppage at a major Ontario slaughter facility likely provided a one-time live hog export boost in 1997). For example, from 1993 through 1997 hog prices in the provinces of Alberta, Manitoba, and Ontario averaged $40/cwt (live weight, U.S. dollars) compared to the Iowa-S. Minnesota direct hog price average of $47/cwt. The 15 percent price discount in Canada compared to the United States encouraged Canadian hog producers to ship increasing quantities of live hogs south for slaughter in the United States. Significantly, the average price differential between the three Canadian provinces and the Iowa-S. Minnesota direct market is near the difference in slaughtering/processing costs between the United States and Canada estimated by Martin, Ball and Alexiou. These results suggest that increases in Canadian hog slaughtering and processing efficiency could lead to significant reductions in live hog exports from Canada to the United States.

The United States is Canada's largest export market as it accounts for 70 percent of Canadian non-processed pork exports and 80 percent of Canadian processed pork exports. Japan, FSU, Hungary, South Korea, Brazil, Hong Kong, Australia, and New Zealand are other important markets. Although the United States both exports and imports pork products, it has recently become a net exporter of fresh and processed pork, exporting 2.4 percent of U.S. commercial pork production in 1997. If imports of live hogs from Canada are included and adjusted to carcass weight, imports of pork products and live hogs into the United States during 1997 were essentially equal to pork product exports. Canada and the United States compete primarily with Denmark, the Netherlands, and Taiwan to supply pork to importing countries.

WHERE WILL HOGS BE PRODUCED IN THE FUTURE?

A recent study by Martin, Kruja and Alexiou (1998) compared hog production costs around the world, including the United States and Canada. In the absence of trade restrictions, pork production is expected to gravitate towards regions with the greatest comparative advantage. Relative production costs are a reasonable proxy for comparative advantage. Using a 1200 sow farrow-finish model based upon previous work by Boehlje et al. (1995), that, essentially, holds technology constant, but allows feed, labor, interest and other variable costs to fluctuate by production location, they conclude the Canadian Prairie Provinces are the lowest cost region in the world to produce hogs. A significant component of the cost advantage identified in this study is related to feed costs, which have declined in the Prairie provinces since the elimination of grain freight subsidies in 1995. Interestingly, they also conclude that Denmark and the Netherlands, large net pork exporters, are high cost production regions. Although this study indicates production costs are significantly higher in the United States than in Canada, perhaps the most important conclusion is that North American production costs are lower than elsewhere in the world, which could lead to a long term expansion in pork exports from both the United States and Canada to importing nations.

U.S./CANADIAN TRADE ISSUES

During the 1980s, several contentious pork trade issues surfaced between the United States and Canada. However, as the U.S. pork industry has become more export oriented, the desire to impose trade restrictions has waned. During the 1990s, the United States imposed a countervail duty on hog imports from Canada that ranged from 0.45 to 1.34 cents per pound. The duty was imposed to offset Canadian farm subsidies which the United States viewed as providing an unfair trade advantage to Canadian hog producers. However, changes in Canadian farm policies have virtually eliminated the need and demand for such duties.

A second trade issue involves the direct movement of U.S. hogs to Canadian packing plants. Currently, U.S. live hog exports to Canada must be certified disease free prior to shipping. Then, hogs must be quarantined for 30 days while tests for brucellosis and pseudorabies are performed. Pseudorabies exists in some U.S. states, but not in Canada. However, 27 U.S. states have been recognized as being free of pseudorabies. The issue is being discussed and several changes have been proposed to the Canadian Health of Animals regulations. If the proposals are accepted, U.S. live hogs could be directly shipped to certain Canadian packing plants if they are sourced from pseudorabies free states, transported only through pseudorabies free states in trucks that have been disinfected, transported through Canada for less than eight hours, and slaughtered within 24 hours of entering the country. The new rules would probably have the largest impact on Ontario packing plants as they attempt to acquire live hogs from less distant sources. However, little importation of live hogs from the United States is likely until the Canadian pork packing sector becomes more efficient.

Driving Forces in Canadian Hog and Pork Production

Removal of grain transportation subsidies has increased feed supplies in Western Canadian provinces causing increased hog production. In response, Moose Jaw Packers in Saskatchewan and JM Schneider in Manitoba have doubled their capacity in the last three years. The availability of inexpensive feed supplies provides Canadian hog producers with a competitive cost advantage. In addition, sizable land masses and low population densities obviates waste disposal and environmental concerns related to hog production. However, the United States has lower wage costs, lower cut and kill costs, and lower marketing costs relative to Canada. Recent trade liberalization has led to increased competitiveness in export markets. In addition to quality, costs must remain competitive to avoid losing market share.

Increased growth of the Canadian hog industry will require changes that reduce other costs if producers are to take advantage of lower feed costs and fewer waste disposal and nuisance problems. Quality assurance will also be an important issue. HACCP plans are used in many plants at this time. In the United States, such plans will be mandatory in addition to other current inspection regulations. Although such plans may improve quality and provide assurances to consumers regarding food safety, such measures are not without costs. The relative costs of all regulations (both HACCP and other regulations) between the United States and Canada could be an important determinant of future competitiveness.

CONCLUSIONS

The Canadian and North American Free Trade agreements increased meat and live animal trade flows across the North American continent and also generated tensions among market participants. Elimination of grain transportation subsidies in Canada has reduced feed grain prices in the Prairie Provinces and encouraged growth in both the Canadian hog and cattle feeding sectors. The result has been increased movement of live hogs and cattle from Canada to the United States. Concurrently, beef and pork exports from the United States to both Canada and Mexico grew.

Although accurate production cost data are difficult to obtain, it appears the United States and Canada have a comparative advantage in grain fed beef and pork production relative to the rest of the world. Consequently, future growth in world meat trade will likely benefit Canadian and U.S. beef and pork producers. If U.S. and Canadian grading standards are unified and the Canadian processing sector becomes more efficient, boxed beef exports to the western United States could increase while U.S. packers may gain a larger share of the eastern Canadian market.

Increased efficiency in the Canadian pork processing sector could also have a big impact on future pork trade. Canadian producers have had strong incentives to export hogs to the United States since Canadian prices have been substantially lower than U.S. prices. The difference was partially attributable to higher processing costs in Canada. Thus, efficiency increases in the Canadian hog processing sector could

lead to a reduction in live hog exports from Canada to the U.S. and an increase in pork product exports. Efficiency gains are probably eminent given recent expansions in the Canadian slaughter sector.

Consolidation, concentration, and further vertical coordination will continue in both the U.S. and Canadian beef and pork industries as producers and processors seek to reduce transactions costs, improve marketing efficiencies, and meet increasing consumer demands for product quality, consistency, convenience, and price competitiveness. The pork sector is currently experiencing this trend, and the beef sector will likely follow in order to remain competitive at the retail counter.

Finally, although opportunities exist for new, convenient beef and pork products, markets for both commodities in Canada and the United States are relatively mature. Given increased concerns regarding the intake of dietary fat and cholesterol, and aging domestic populations, future growth in the U.S. and Canadian beef and pork sectors will likely be provided by increasing exports. Specifically, growing incomes in developing countries provide the opportunity for consumers in those countries to obtain more protein from animal sources. Both the United States and Canada are well-positioned to supply expected increases in demand for animal protein in developing countries. For that to happen, policy makers and the red meat industry need to work hard to increase market access and meat supply safety while ensuring the industry retains its cost competitiveness.

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STRUCTURAL DEVELOPMENTS IN THE CANADIAN LIVESTOCK SUBSECTOR: STRATEGIC POSITIONING WITHIN THE CONTINENTAL MARKET

Jill E. Hobbs and William A. Kerr

INTRODUCTION

The significant deepening in the international integration of food markets which is generally observable at the end of the 20th century can be attributed to two main forces. The first is the liberalization of international commercial policy which is manifest in two forms: (1) the creation and strengthening of regional trade agreements and organizations; and (2) the renewed vigour of the multilateral trade system in the wake of the Uruguay Round and the creation of the World Trade Organization (WTO). The second force fostering international integration in food markets is the bundle of inter-related technological changes underlying the process which has become known as *globalization*. While the revolution in electronic information transfers is the most obvious of these changes, revolutions in data collection and data processing, transportation and biotechnology are all major contributors to the internationalization of the agri-food industry.

The removal of formal trade barriers and other impediments to international commercial relations and the technical changes associated with globalization have put agribusiness into a state of disequilibrium. Agribusiness firms (including those in the livestock subsector) must respond to the dual challenges of increasingly open markets and the need to take on board a range of risky new technologies. The reduction or removal of trade barriers means new opportunities in more distant and often unfamiliar markets. This means longer supply chains. Efficient and effective management of longer supply chains may require changes in business organization including transnational investments, strategic alliances or complex contractual relationships. Open markets may also mean the threat of increased competition. Small, isolated firms may find it necessary to seek out partners, sometimes among their old but now equally isolated domestic rivals, to ensure their survival.

New data gathering and processing technologies provide managers with more and better quality information. Information can now be packaged in convenient forms and transferred instantaneously. This information may have economies of scale implications if it can be shared along the entire supply chain. Individual firms, which have traditionally hoarded information because it provided them with strategic advantages when dealing with suppliers or customers, may find themselves disadvantaged relative to vertically integrated competitors or relative to supply chains organized in ways which allow cooperation in the use of information.

More and better information allows agribusiness firms to respond both to consumers' desires for new product characteristics and the need to manage products which have a higher component of intellectual property. The latter means that supply chains, although efficient in the provision of commodities, may not allow the developers of products with a significant intellectual property component to capture the returns on their investment in developing the intellectual property. New forms of organizing supply chains will be required to fully take advantage of the benefits of, for example, biotechnological research.

All of these forces act in concert to impose, through competition, structural change on agriculture. Fundamentally, the structural changes taking place in North American agribusiness relate to changes in how supply chains are organized. Changes in the organization of supply chains are, however, almost impossible to quantify. First, the benefits to firms from reorganizing supply chains come from reductions in the transaction costs associated with coordinating the progress of products as they move along the supply chain. Unfortunately, information on transactions costs is not collected (nor is amenable to collection) by government statistical agencies or through the standard accounting procedures of firms (Hobbs, 1996a). Second, most of the structural changes arising from trade liberalization and globalization have tended to move away from supply chains based on transparent markets towards closer relationships such as contracts, strategic alliances and vertical integration. Information on transactions organized by these means tends to be proprietary and secret. Firms are often reluctant to share this information with researchers because they fear that it may be released inadvertently to their competitors.

As a result, discussions regarding the structural change currently being observed in North American agribusiness is constrained to being largely descriptive rather than quantitative—a point of frustration for agricultural economists and policy makers who are accustomed to the quantitative analysis which can be undertaken with data generated from spot and near-spot markets. The lack of quantitative evidence, however, largely can be overcome by well developed theoretical propositions and a thorough understanding of the industry. The ability to fully test theoretical hypotheses regarding structural changes in the agribusiness sector will have to await the collection of data on transaction costs (Coase, 1972).

THEORETICAL CONSIDERATIONS

In the past, structural adjustments have often been equated with changes in the number and size of farms. Concerns regarding the changing ownership of farms—owner operators, partnerships, family corporations or corporate owned and managed have also been considered under the broad heading of structural change. Markets were the dominant means of organizing transactions and establishing prices. The structural change currently taking place in North American agriculture, however, relates to how agri-food supply chains are organized from the providers of agro-inputs through to the final consumer (Hobbs et. al. 1996). While the reorganization of supply chains will affect farms, its major manifestation will be upon the ways farmers interact with other participants in the supply chain rather than on the size of farms or their number. The structural change will affect farmer's managerial independence (Klein and Kerr, 1995). These changes relate to the evolving nature of vertical coordination of agricultural supply chains of which the effect on farms is only one aspect of a much broader structural change.

New Institutional Economics is concerned with, among other things, the process of coordination in industrial organization. Vertical coordination refers to the organization of transactions along the supply chain. A transaction is required whenever a product moves from one vertically separable stage of production and/or distribution to another (Hobbs, 1996a). Vertical coordination can be accomplished through a large number of mechanisms including market price signals arising from a spot market, contracts, franchises, joint ventures, within-firm managerial orders etc. (Mighell and Jones, 1963).

In New Institutional Economics the term "transaction" takes on a broader meaning than the generally accepted English usage because it includes coordination through within-firm orders given by managers as well as transfers between firms. Extending the firm to encompass an additional transaction within its managerial structure is just one alternative method of coordinating a transaction and establishes the limits to the size of a firm (Coase, 1937). One of the central tenets of New Institutional Economics is that transactions do not occur in the frictionless economic environment assumed in standard neoclassical economics (Hobbs, 1996a). The existence of friction means there are costs associated with organizing transactions—transaction costs. Transaction costs are particularly important when complex transactions are associated with vertical coordination activities. Complex transactions are those where the quality of the goods is not transparent, where there are complicated quality and/or performance specifications and when production and payment take place over time (Kerr, 1996).

The transaction costs associated with complex transactions can be divided into three main classifications: information costs, negotiation costs and monitoring/enforcement costs. According to Hobbs (1996a):

> Firms and individuals face costs in the search for information about products, prices, inputs, buyers and sellers. Negotiation costs arise from the physical act of the transaction, such as negotiating and writing contracts (costs in terms of managerial expertise, hiring of lawyers, etc.) or paying for the services of an intermediary to the transaction (such as an auctioneer or a broker). Monitoring or enforcement costs arise after an exchange has been negotiated. This may involve monitoring the quality of goods from a supplier or monitoring the behaviour of a supplier or buyer to ensure that all the pre-agreed terms of a transaction are met. Also included are the costs of legally enforcing a broken contract, should the need arise. (p. 17).

It is expected that the method of vertical coordination which incurs the lowest transaction costs, *ceteris paribus*, will be the one which survives under competitive pressure. The combination of vertical coordination mechanisms which yields the lowest overall transaction costs will determine the industrial structure of the supply chain. Changes in the relative transaction costs of alternative coordination mechanisms can lead to a new industrial structure for a supply chain. Any altering of the organization of supply chains is likely to be a gradual process with alternative structures operating side by side until competitive pressures force firms using more costly forms of vertical coordination to either adopt the more efficient form or exit from the industry. As suggested above, it may not be possible to quantify the changes in transaction costs but it is important to identify those forces which are likely to alter the relative values of information, negotiation and monitoring/enforcement costs. If these forces can be identified, then transaction cost theory should provide considerable insights into observed and future changes to industrial structure in the North American agri-food system.

FACTORS INDUCING STRUCTURAL CHANGE IN THE CANADIAN LIVESTOCK SUBSECTOR

Trade Liberalization: NAFTA and CUSTA

The changes to Canada's international trade regime for agriculture, which have been brought about over the last decade by the combination of the Canada-United States Trade Agreement (CUSTA), the North American Free Trade Agreement (NAFTA), and the Uruguay Round Agreements including the advent of the WTO, are significant. Structural adjustments in a number of subsectors, and in particular in the western Canadian grains industry, have been the result. The agreements, however, have had little direct effect on the structure of the Canadian livestock subsector.

Tariffs and the effects of non-tariff barriers such as border inspections and unharmonized health, sanitary and phytosanitary regulations are costs associated with organizing international transactions (Kerr and Perdikis, 1995). For example, learning about and complying with foreign sanitary regulations for beef is an additional information cost which must be incurred when organizing an export

transaction. Border inspection fees are a negotiation cost which must be paid to facilitate the export transaction. These costs (or their avoidance) are often used to explain the predominance of a particular method of vertical coordination in international transactions. For example, vertical coordination being undertaken by transnational corporations rather than directly exporting to foreign importers is often explained by the ability of transnational corporations to use within-firm transfer prices to minimize *ad valorem* tariffs (Kerr and Perdikis, 1995). Low export prices are reported to importing customs. The transnational simply charges a higher mark-up on its product in the importing country to offset its lower margin in the exporting operation. If the sale is made to an independent importing firm then the transaction must be undertaken at a price which reflects the normal mark-up for the exporter. As a result, a higher tariff will be paid. Thus, the lower transaction cost represented by the lower tariff gives the transnational form of vertical coordination an advantage over exports based on market transactions.

Liberalization arising from the trade agreements reached over the last decade has not been an important impetus for structural change in the Canadian livestock subsector for the reason that trade in livestock and meat was relatively free prior to the CUSTA. Tariff levels were so low as to be considered a nuisance rather than a real barrier to trade (Kerr and Cullen, 1985). For example, Canada did not have tariffs on the import of live hogs or pork from the United States. The United States had no tariffs on the imports of live hogs, and tariffs of 4.4 cents / kg on some Canadian pork products. Canadian tariffs on live beef animals were only 2.2 cents / kg and 4.4 cents / kg on some U.S. beef products. United States tariffs on cattle and beef were of similar magnitudes. Hence, their removal had little effect on either industry.

A number of non-tariff barriers to trade in livestock and meat did exist prior to the CUSTA (Kerr, et. al. 1986). The Canadian pork industry had been subject to several U.S. countervail actions and, along with a large number of Canadian industries, wished to see changes to U.S. contingent protection procedures. The Canadian beef industry complained about the arbitrary nature of U.S. border inspections for meat. The differences in beef grading systems was seen as a technical barrier to trade (Kerr, 1992). The independent development of health and sanitary regulations in the two countries added to the cost of trans-border transactions.

Each of these non-tariff barriers was dealt with either explicitly or implicitly in the CUSTA. In articles 1906 and 1907 of the Agreement, the two countries agreed to develop a mutually acceptable set of procedures for countervail and anti-dumping. Article 708:3 explicitly made provision for the removal of border inspections on meat. Articles 604 and 609 addressed the harmonization of technical standards such as beef grades. Article 708 promised consultation in the development of new health, sanitary and phytosanitary regulations. As yet, however, none of these provisions has been effective in removing the non-tariff measures affecting the Canadian livestock subsector (Hayes and Kerr, 1997).

The provisions which specified that the new mutually acceptable procedures for anti-dumping and countervail would be developed under a strict timetable were effectively gutted with the removal of the seven year limit for negotiations in the NAFTA agreement (Gerber and Kerr, 1995). Only the marginal improvement which allows bi-lateral panels rather than national courts to adjudge whether correct procedures have been followed by domestic investigative agencies remains of the CUSTA's pledge to remove this major trade irritant. As a result, the Canadian livestock industry does not enjoy a significant improvement in security of access to the U.S. market relative to the pre-CUSTA era.

Despite the commitment to remove border inspections for meat, inspections continue to take place and remain a trade irritant (Hayes and Kerr, 1997). The granting of equivalence for, or harmonization of, beef grading systems in the two countries remains in limbo due to internal wrangling within the U.S. National Cattlemen's Beef Association. This is in spite of a study commissioned by the Association which suggested that the granting of equivalence in beef grades would be beneficial to both industries (Hayes et. al. 1995). Consultation on developing health, sanitary and phytosanitary rules appears to fall short of what was envisioned in the CUSTA (Hayes and Kerr, 1997). In short, little has changed on the non-tariff barrier front and, hence, the Agreements have had only a marginal direct effect on the structure of the Canadian livestock subsector.

One possible effect of the CUSTA/NAFTA may have been an improved investment climate for potential foreign investors in the Canadian meat packing industry. One school of thought is that, from the Canadian point of view, rather than a means to liberalize trade, the CUSTA was a means to protect existing Canadian access to U.S. markets from the threat of increasing protectionism in Congress. The investment clauses in the CUSTA, combined with Canada's unilateral reduction in the powers of the Foreign Investment Review Agency, made it easier for U.S. investors to make *greenfield* investments in Canada or to acquire Canadian firms. The combination of the removal of the threat of capricious U.S. protectionist measures and a simplified and friendlier foreign investment environment may have been instrumental in the decisions of two large U.S. beef packers to invest in facilities in Western Canada. It may also be a factor in current foreign interest in pork processing facilities in the prairies.

The improved investment climate, combined with the continued existence of non-tariff barriers to trade may, indeed, give U.S. multinationals an advantage over Canadian firms in the U.S. market. The beef industry works on the tight distribution timetables required for the efficient operation of *cold chains*. Typically, a U.S. meat importer or broker will have already made a commitment to a final buyer when meat is contracted from a Canadian supplier. If the load is detained or rejected at the border, the importer is unable to fulfil the commitment to the final customer and must seek out alternative suppliers. The multi-plant U.S. meat packers which have plants in Canada will be subject to the same possibility of having loads rejected at the border as a Canadian exporter but will be better able to make up the shortfall in the

U.S. market from product available in its domestic plants. Thus, they are perceived as more reliable suppliers and represent a preferred organizational structure relative to stand-alone Canadian plants in the developing continental market for red meat.

Trade Liberalization: Uruguay Round Agreements

The Uruguay Round agreements have yet to have a significant effect on the markets for Canadian livestock products outside the NAFTA region. The recent WTO disputes panel decision to support the U.S. contention that the European Union's (EU) ban on imports of beef produced using growth hormones could not be justified on scientific grounds may lead to the opening up of the European market to Canadian beef. The EU is currently re-assessing the scientific evidence but is likely to have to comply with the WTO ruling. Compliance, however, may take the form of providing compensation rather than opening up the EU's market, given strong consumer resistance to beef produced using growth hormones. Access to the Japanese market for beef and pork is little affected by the Uruguay Round. The Canadian pork industry struggles to maintain its market share against competitors (Hobbs, 1996b) and the beef industry has struggled to expand its market share in the wake of the Japanese liberalization of its beef import regime (Kerr, et. al. 1994). The difficulties which the Canadian beef industry has encountered in the Japanese market can, in part, be explained by the high transactions costs associated with the export supply chain (Anderson, et. al. 1992). Canada appeared as if it would benefit from the liberalization of the Korean meat importing regime which resulted from the Uruguay Round agreements. The Asian economic crisis, however, has hit Korea particularly hard and any export growth will have to await the recovery of the Korean economy.

The trade agreements have had a considerable indirect effect on the Canadian livestock subsector. The Uruguay Round Agreement (URA) on subsidies (along with the fiscal difficulties of the Canadian federal government) led to the abandonment of the Western Grain Transportation Act (WGTA) rail transportation subsidies for grain. The effect of removing the rail subsidy was to lower the price of grain in Western Canada. The elimination of the Crow Subsidy, combined with the previous abandonment of the Feed Freight Assistance subsidies, has brought natural economic forces to bear, leading to an expansion of the beef and pork feeding industries in Western Canada and the north-south movement of meat products. Western Canadian product can be shipped profitably to beef deficit areas in the western United States, while central Canada can receive increasing supplies from the cattle feeding areas of the US Midwest. There is an ongoing geographic realignment of the industry which reflects the underlying advantage of the prairie region in cattle and hog feeding. The rapid expansion of the feeding industry in southern Alberta near Lethbridge is the most obvious example of this geographic realignment but the resurgence in interest in feeding pigs in a number of places in the prairies also attests to the gradual realignment of the Canadian industry in the post-Crow Rate/WGTA era. The changing economics of the prairie grain industry arising from the removal of rail subsidies for the export of grain and the possibility of further deregulation of the grain market has led to a radical shift in business strategy for one of western Canada's large grain-handling firms—the Saskatchewan Wheat Pool. It has been following an

aggressive program of diversification including substantial investments in the livestock subsector. The objective is to have the organization positioned to take full advantage of growth areas in the continental market.

The expansion of the livestock industry in Western Canada has meant large investments in new facilities. The design and geographic location of these new facilities has been undertaken with an eye to positioning to best take advantage of the developing continental market in beef and pork. To fully capitalize on the continental market, however, firms in the livestock supply chains must respond to the technological forces underlying the process of globalization. These technological advances have been much more important than those arising from trade agreements in forcing structural change on the Canadian livestock subsector.

Globalization

The technological advances that underlie the process of globalization are providing the impetus for structural change in the Canadian livestock subsector. Those who dislike the structural changes which the industry is undergoing often apply the term *industrialization of agriculture* to the new systems of coordination which are emerging. Are the changes observed in the beef and pork industries leading to industrialization—with its connotation of production line rigidities and factory working conditions? Recent developments in the livestock industries fundamentally are changes to the way supply chains are coordinated. They are altering how the major actors in the meat production and distribution system, e.g., input suppliers, ranchers, feedlot operators, meat packers and retailers, deal with one another. Instead of competitive advantages stemming from better production technologies, lower input costs or even better management, the competitive edge is also now seen to arise from reorganizing the supply chain.

Heterogeneous Tastes and Niche Markets. The revolution in the electronic transfer of information allows firms to access information on distant markets instantaneously. This information flow consists not only of price information but also information on quality specifications and product preferences. It also lowers the cost of acquiring information on the reputation of potential customers/suppliers. This widens the available markets. Furthermore, it increases the ability to cater to niche markets which require products with unique characteristics.

The existing system of vertical coordination in livestock supply chains was well suited to consumers with relatively homogeneous tastes. Homogeneous tastes meant that the supply chain focused on the production and processing of animals with a single set of characteristics which were set out in the parameters of the premium grade. The biological nature of livestock production meant that not all animals would achieve the premium grade but producers had a stylized animal at which to target their production practices (Considine, et al, 1986). If an animal failed to reach the premium grade, it received a discounted price. The discounts were well established and understood. As long as sufficient buyers existed, prices could be determined though competitive auctions. Markets were the vertical coordination

mechanisms. The public nature of auctions provided a valuable externality to farmers in the form of a transparent and relatively inexpensive price information system.

If the number of buyers declined to the point where auctions could not ensure competitive pricing, alternative vertical coordination mechanisms had to be found. Formula prices set by provincial hog marketing agencies and board-run electronic auctions in Canada are but two examples. Processors and retailers shared the preparation of meat cuts butchered from relatively homogeneous carcasses for consumers whose eating habits required a simple set of characteristics—freshness, tenderness, marbling, limited external fat, etc. In this system, farmers were left independently to produce target animals to the best of their abilities. The *farm gate* provided a barrier behind which farmers could manage their operation without fear of interference from others in the livestock supply chain (Klein and Kerr, 1995).

The system described above begins to break down when consumers no longer have homogeneous tastes or when they demand products with additional characteristics which cannot be incorporated into the existing grading system. When consumers' tastes are no longer homogeneous, animals with different characteristics are required. This means that individual buyers will require animals which differ from other buyers. This removes the competitive aspect of price setting. Prices must be negotiated one-on-one with buyers. Further it means that the farmer has produced a specialized animal which will not be as valued by other buyers and will be heavily discounted if the farmer attempts to switch buyers once the animal is produced. This leaves the farmer vulnerable to *opportunism* by the buyer. If the farmer produces these specialized animals on speculation, as in the traditional supply chain, the buyer has considerable negotiating power since the farmer has a perishable product and no other comparable buyer for the product.

Buyers are also vulnerable because they typically have product commitments further down the supply chain but no assurance that these can be filled without some formal arrangement with individual producers to provide animals with the particular set of characteristics. The vulnerability of both farmers and processors means that speculative feeding carries considerable risks: i.e. the information and negotiation costs of speculative feeding are high.

The solution is some form of contractual arrangement between producers and buyers. However, this increases some transaction costs. Processors may have to commit to a purchase price prior to the farmer committing resources to production. This means they must incur higher transaction costs in acquiring price information—because they must attempt to forecast their selling price in the future so as to determine the price they can safely offer the farmer prior to production. With no transparent pricing system, farmers are forced into spending more time gathering information prior to negotiations with processors.

The poultry supply chain in the United States has moved the furthest down the road to specialized production, with the supply chain already having undergone a major change. In the United States, ninety percent of broilers are produced under contract and spot markets no longer exist (Sheldon, 1995). Of course, the poultry industry, with its short generation interval, can quickly breed and produce birds tailored to the needs of any individual customer. Over the last decade, the U.S. pork industry has begun to follow the poultry industry in tailoring hogs. Nearly twenty percent of hogs in the United States were grown on contract in 1990 compared to 1.5 percent in 1980 (O'Brian, 1994). It is probably not surprising that one of the areas of discussion when new investments in hog processing are being considered for Western Canada is the role that provincial hog boards will play in price setting. Single desk selling has been a primary function of some hog boards but new processors want the flexibility to engage in contracting. This is the only way they feel they can be competitive in a continental market where contracting is proving to be the efficient form of vertical coordination. Of course, some existing hog farmers are worried about the dependency created by contracting and the unequal bargaining power which arises in one-on-one negotiations with processors. It is clear that this structural change is beginning to take place in the pork industry in Western Canada.[1] The Quebec industry has been characterized by contractual relationships among members of the supply chain for decades and this close relationship is suggested as one reason for the industry's success.

Food Safety, Quality Assurance and Traceability. A second, but related, force for change revolves around the increased emphasis placed on food safety and quality assurance issues in the livestock subsector. Consumers are demanding additional characteristics associated with their beef. For example, supermarkets in Britain now offer guarantees that the animals from which their meat products are derived have been raised on farms with high animal welfare standards. This requires increased traceability from the supermarket back to the farm. It also means that a degree of the farmer's managerial independence has been removed. Other players have passed through the farm gate to intrude into the farmer's managerial decisions. The Bovine Spongiform Encephalopathy (BSE) crisis, and other concerns with food safety, have led to the use of a system of cattle passports and movement documents which allows the history and movement of any beef or dairy animal to be traced. The EU requires that a computer data base be established which will record both the identification number of all beef animals present on a farm or other facility and changes in the whereabouts of each beef animal starting from where the animal was born. In the United Kingdom (UK), this database will be operational at the end of 1999.

At the heart of traceability is the improvement of food safety. However, once the system is in place it can also be adapted to provide information on quality and other desired characteristics such as animal rearing practices or *organic* production. The latter can be seen simply as special characteristics desired by consumers whose preferences differ from those of other consumers. In other words, they represent

[1]As of May 1998, each of the three prairie hog marketing boards has been deregulated to allow opting out by producers (Ed.).

niche markets. These characteristics require traceability systems to assure consumers that the product they purchase has the desired characteristic. The attributes cannot simply be incorporated into the grading system. Further, improved food safety and better quality control require traceability and the introduction of standardized quality control measures along the supply chain. The electronic collection and management of large quantities of data have now reduced the cost of acquiring and utilizing these forms of information. Cooperation along the supply chain is necessary because livestock and meat production represent interactive and interdependent biological systems where the effort which one segment of the supply chain takes to improve quality or food safety can be negated by the inattention of another player along the supply chain.

Given the large dependence of the Canadian beef industry on the U.S. market, changes in the U.S. industry must be watched closely in Canada. For example, the Canadian Cattlemen's Association (CCA) has introduced a quality assurance program (*Quality Starts Here*). In its manual for cow-calf producers, the CCA stresses the importance of the continental market:

> …our growing export dependency...Canada's beef industry is export dependent...It is in our best interest to set a higher standard for product quality and safety to ensure market access. (CCA, 1997a).

In an address to the 10th World Meat Congress in 1995, Dr. J. Prucha, Deputy Administrator of the U.S. Federal, State and International Inspection, Food Safety and Inspection Service stated that:

> Just like domestic plants, foreign plants exporting meat to the United Stares will need to operate using a formalized, documented HACCP system—or an equivalent risk-based scientific process control system. (Prucha, 1995, p. 23).

In the wake of highly publicized E. coli outbreaks, inspection services in the United States were refocused toward reducing pathogenic micro-organisms. A shift in focus within the U.S. industry was also encouraged. Prevention was to replace detection as the objective of food safety programs. A core part of this strategy is the adoption of Hazard Analysis Critical Control Point (HACCP) programs. Meat processing plants are required to implement HACCP programs which can be verified by government inspectors. The United States requires that a country wishing to export meat to the United States prove that its system of safety procedures and inspection is equivalent to those in the United States.

The Canadian industry, however, has ample domestic reasons for wishing to improve food safety procedures. The devastating effects of breaches in food safety in other countries has not been lost on the industry. In a document proposing a national identification system for Canadian beef, the CCA (1997b) warns that:

> Industry leaders have received ample evidence of the need for such a capability and the cost consequences of complacency. In briefest justification, a devastating disease such as Bovine Spongiform Encephalopathy (BSE) might as suddenly occur within our industry as it did in Britain and with similar consequences. (p. i).

Further, they state:

> Recent food safety issues in other countries and in various commodities have demonstrated what can happen to a market. Conversely, California strawberry growers were able to maintain market access in the middle of their food safety issue, by demonstrating the unsafe products were not theirs by means of an identification system. (p. 18).

Clearly, the message is that it must not be allowed to happen in Canada.

The Canadian livestock industry associations have taken the lead in developing quality assurance schemes. The Canadian Pork Council (CPC) developed a national quality assurance scheme at the farm level. A manual was produced which specified good production practices and record keeping. The focus is on enhancing food safety. The scheme was piloted on a trial basis in 1997. The hog quality assurance scheme is based on HACCP principles with independent verification of on-farm standards and judgement as to whether a producer can claim to have produced animals in accordance with the rules of the quality assurance scheme. The scheme is, however, voluntary.

The CCA has developed a number of quality assurance schemes for the various segments of its industry. The *Quality Starts Here* program was developed through collaborative discussions with all those along the food chain—cow-calf operators, feedlots, packers, veterinarians and pharmaceutical companies. The objective was to develop a set of good production practices to deal with sanitation and feeding issues and to minimize problems arising from lesions and bruising at injection sights and with drug residues. It is important to note that this program was developed to improve the beef supply chain as a whole and to augment the processing industries' in-plant HACCP programs. In part, it attempts to reduce information costs along the supply chain. Manuals have been produced and distributed to those interested including: *Good Practices Guides* for cow-calf operators and feedlots and *Recommended Operating Procedures for Feedlot Animal Health*. The procedures are based on HACCP concepts. Little is known about the degree to which they have been adopted. At present, the CCA schemes do not include provisions for independent monitoring of cow-calf operations or feedlots. This may be a weakness of the scheme as it may not be accepted by those further along the supply chain (by retailers or the Hotels, Restaurants, and Institutions [HRI] trade) and, in particular, export markets. Without independent accreditation, this quality assurance scheme cannot claim to be

HACCP-based. If, over time, producers feel that they receive a premium for animals raised according to the specifications of the quality assurance scheme, pressure may increase to have independent verification.

The CCA has also endorsed a national animal identification scheme. Technical details still need to be worked out to ensure that maximum use can be made of the information. The need for the information to be transferred from the live animal to the carcass remains a technological challenge. However, there is cooperation to find a solution. It is intended that:

> In the event of an incident that requires traceback, it will be possible with this system to identify the last herd (feedlot, pasture group, etc.) in which the subject animal was located and, from the ear tag, the herd of origin. Equipped with these two pieces of crucial information health authorities will be able, in most cases, to trace the movements of the subject animal(s). (CCA, 1997b, p. vi).

The beef industry association's quality assurance scheme, however, remains voluntary and without independent audits. Given the possible shortcomings of the scheme, it is probably not surprising that beef processors have initiated quality assurance schemes of their own. Beef packers, particularly those involved in international sales, exhibit a growing recognition of the importance of HACCP-based quality assurance schemes. Given that plant-based HACCP schemes have a considerable fixed cost associated with their implementation, it is probably not surprising that larger plants implemented HACCP procedures first (Molder et al, 1995).

Having put plant-based HACCP programs in place, a number of beef packers have been attempting to institute quality assurance schemes among their suppliers. Strategic alliances have been negotiated with feedlot and cow-calf operators based on company-specific quality assurance schemes. For example, in the fall of 1997, Cargill launched a program in Western Canada entitled *Beef Works*. The quality assurance scheme is based on a program which has been operating since 1995 in Nebraska. *Beef Works* is designed primarily for cow-calf operators who wish to maintain ownership of their cattle through to slaughter. Cargill Foods must certify the genetic suitability of the producer's calves. Once the cow-calf operator is approved he/she must sign up a specific lot of cattle for the *Beef Works* scheme. Cargill guarantees to purchase the animals when they are ready for slaughter. A set of *best practices* designed to maximize quality of the carcass are provided by Cargill. Some of these *best practices* are mandatory while others are simply recommended. Feeding at the cow-calf level is at the discretion of the producer although there are recommended dietary guidelines. When the calves are moved into the feedlot, the animals must be fed a ration specified by Cargill and based on the company's feed inputs. Using ultrasound technology on live animals, Cargill advises producers of the optimum time to slaughter their cattle. Price is determined on the basis of carcass grades using Cargill's value-based pricing grid which assigns premiums and deductions according to the quality of the carcass. This private evaluation of carcasses assesses quality in a much more detailed fashion than the government grading system.

As a member of the scheme, *Preferred Cattle Suppliers* and *Preferred Feedlots* receive detailed information on the carcass, feedlot growth performance and the profitability of each animal. Producers can use this information to aid in their breeding and feeding decisions and to evaluate their management practices. Clearly, this scheme is a far cry from speculative feeding for a homogeneous market and represents a fundamental change in the structure of the beef supply chain. While the scheme is still very new, it may represent the way information flows can be enhanced and transaction costs can be reduced in the process of improving beef quality. Some Canadian beef packers have initiated similar schemes and others are considering them. If they improve the profits of both packers and producers, they may prove to be more competitive than the existing system. In the process, other players have passed through the farm gate and have an interest in on-farm management practices. This alters the relationship between those operating along the beef supply chain.

The major change which strategic alliances and other forms of cooperation along the red meat supply chain have brought is the sharing of information. Improved electronic data collection and handling facilitate this process but it represents a fundamental change in how producers and processors approach the use of information. When the supply chain was largely coordinated through auctions and other forms of spot markets, information could be used strategically to gain commercial advantage for individual participants along the supply chain. Auctions allowed farmers to bundle animals which they knew had poor performance characteristics with better performers in the hope that buyers would be fooled—an asymmetric information problem. Processors, on the other hand, expected that their buyers could use their expertise and superior market information to pick up bargains; for example, cattle purchased on a liveweight basis which would subsequently produce higher meat yields than that represented by the liveweight purchase price. This system is inherently confrontational and leads to distrust among supply chain participants. There is considerable evidence that supply chains organized on a more cooperative basis can lead to efficiency gains (Hobbs, 1996b).

It is interesting to note that, as yet, cooperation along the supply chain has not extended to any great extent to the interface between packers and retailers. In the UK, where consumer advocacy is stronger than in Canada, supermarkets have become heavily involved in cooperative ventures along livestock supply chains—particularly over food safety and animal welfare issues (Hobbs, 1996c). The experimental program implemented between the Loblaws supermarket chain and XL Beef of Calgary to provide *natural* beef to the Ontario market represents one example of such cooperation. The program required strict monitoring of production practices, including XL Beef's own vertically integrated farm operations, and strict traceability through the entire supply chain. While the program did not prove profitable over the long run due to consumer resistance to the price premiums required for *natural* beef, it is an example of an entire supply chain cooperating to provide consumers with non-traditional product characteristics. Another example is a currently operating strategic alliance between Cargill and the Loblaws supermarket chain in Ontario for the supply of case ready meat. However, at present, these examples remain the exception rather than the rule.

The two forces for structural change, i.e. the desire for niche market animal products and the demand for improved food safety, emanate from consumer preferences. The third force which will promote the need for structural change in the Canadian livestock subsector arises from changes in production technology.

Production Technology and Agricultural Research. The major underlying change in agricultural production stems from a revolution in the agricultural research industry. A number of forces are altering the way agricultural research is funded, organized and conducted (Klein and Kerr, 1995). The fiscal difficulties of the Canadian governments has led to a considerable decrease in government research funding (a 20 percent reduction in Federal funding was announced in 1995) and has forced researchers to seek out private partners. An incentive is provided through matching grants. Fiscal restraint, however, is only part of the story. The traditional rationale for public funding of agricultural research was a *public good* argument (Davies and Kerr, 1997). With natural reproduction it was seldom possible for those who invested in research to capture the gains arising from that research. This would mean underinvestment in research. The increasing demand for niche market products discussed above, combined with biotechnological research processes, mean that those who are willing to invest in the research are more likely to capture sufficient returns to justify their risk-adjusted initial investments.

The changes in vertical coordination mechanisms in U.S. pork supply chains illustrate the importance of the new livestock research environment. Historically, breeding stock were produced by specialized breeders or producers who followed a cross breeding program to raise their own replacements. To meet the market driven requirements of higher carcass quality, large integrated pork supply chains have contracted with large genetics companies such as Pig Improvement Co. (PIC) and Newsham Hybrids Inc. (mostly European based) for their breeding stock (Klein et al, 1995). The genetics companies conduct their own research and capture the rewards through the sale of their unique breeding stock.

The developments in hog breeding have also affected the vertical coordination mechanism. In the past, there was a strong transparent market for breeding stock. Most purebred breeding stock was sold through auctions. With the entrance of the new genetics companies, there is no longer a need to use auction sales. These companies sell directly to their customers and also provide recommendations on breeding programs so that producers can maximize the potential of the animals they purchase. They have been particularly successful in marketing to large hog producers. Again, others have passed through the farm gate and have an interest in on-farm management practices.

An increasing proportion of the new research in agriculture is encompassed within the umbrella of biotechnology. Although field testing will always remain location specific, genetic manipulations and the development of monoclonal antibodies can be done in laboratories anywhere in the world. This means there will be opportunities for research laboratories to specialize internationally and *trade* their research and products. Most products of biotechnological research can be patented

and, thus, restricted in their use to only those who can pay. This creates opportunities for the private sector to participate and profit from agricultural research. These specialized products will often require the sharing of information and managerial expertise with human capital dedicated to the individual product. This suggests a greater degree of vertical integration initiated by input suppliers or through strategic alliances between input suppliers and producers. Of course, the ability to genetically tailor animal inputs dovetails with the consumer desires for niche products and increased food safety. This suggests gains from sharing information all along the supply chain. Although commercially still in the future, transgenic animals, and even clones, may alter the cost of monitoring production, hence, suggesting changes to the organization of supply chains (Hobbs and Kerr, 1998). While the full effect of the biotechnological revolution has not yet been felt in the large animal industries, including those in Canada, the potential to induce structural change appears to be considerable.

CONCLUSIONS

Structural changes tend to take place over long periods of time. They are not easily measurable and are by their very nature disequilibrium phenomena. Hence, they are not particularly amenable to the comparative statics analysis which economists find most tractable. When economic systems are in disequilibrium, paths of adjustment are seldom linear or transparent. It is a time for experimentation and for incorrect paths to be explored. All of this makes the task of predicting new equilibriums extremely difficult. It is important, however, to have a strong theoretical basis for analysis and to identify the forces which are at work.

The Canadian livestock industry was operating in a continental red meat market even before the recent agreements to liberalize trade within North America and multilaterally. The trade agreements have ensured that Canada will have continued access to continental markets over the long run. While trade irritants in the form of non-tariff barriers remain, the increased security of access has altered the investment climate for both large U.S.-based agribusiness firms such as Cargill and IBP, and Canadian agribusinesses such as the Saskatchewan Wheat Pool. New investments are made with the realities of the continental market in mind. The multilateral disciplines on subsidies arising from the Uruguay Round have put the Western Canadian grain industry on more of a market basis and, as a result, has altered the location economics of the Canadian livestock industry.

The changes arising from new international trade regimes are not, in themselves, sufficient to lead to a structural change in the Canadian livestock subsector. The changing location economics and trade flows have led, however, to opportunities for new investments. Those considering investing in the Western Canadian livestock industry wish to position themselves to best take advantage of the continental market. To do this, they need to examine new ways of organizing supply chains because the technologies underlying the process of globalization seem to point to clear advantages to a more cooperative approach to vertical coordination in supply chains. In particular, the sharing of information along the supply chain

appears likely to lead to improved efficiency. Of course, the revolution in electronic information technology means that more and better information can be collected and disseminated at a lower cost. This cooperative approach to supply chain management is the real structural change taking place in the livestock subsector.

Of course, new organizational forms are more likely to be associated with new investments, e.g. the move to contracting hogs in Western Canada. This does not mean that the pressure to change will not be felt in the existing supply chains but a substantial amount of previous investment is based in the current vertical coordination institutions and there will be considerable vested interests in the status quo. In particular, the loss of farm level managerial independence implied by the new forms of organization is likely to be resented and resisted by many farmers. Old habits of confrontation along the supply chain—between producers and packers or processors and retailers—will not easily be forgotten. Institutions such as provincial hog boards may well adapt and have a positive role to play in assisting farmers in an era of contracts and managerial oversight.

One thing seems clear, the new structure that emerges in the Canadian livestock subsector will be based on information sharing and closer managerial cooperation.

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NATIONAL CATTLEMEN'S BEEF ASSOCIATION

Chuck Lambert

There are probably many more areas of agreement than disagreement among the industries within the North American trade region. National Cattlemen's Beef Association (NCBA), along with the associations from Canada, Mexico, Australia and New Zealand, meet about every 18 months in a five-nation beef conference to discuss issues of importance in the trade arena. We are especially interested in issues relating to the European Union (EU) and the 1999 round of World Trade Organization (WTO) negotiations. In 1999, we will also invite the cattlemen's associations from Uruguay and Argentina to attend the five-nation meeting and invite them to join this group on a permanent basis to discuss trade issues of mutual interest.

In the United States, efficiencies from alliances are changing the way we have done business historically in the beef industry. Our industry has traditionally been a segmented, dispersed industry. The production model has resulted in many antagonisms among the sectors—cattle trading hands two to five times with no information passing among the sectors. We have seen what has happened to beef's market share with respect to an integrated poultry industry. Restructuring the pork industry is positioning pork to do similar damage to beef with respect to beef's market share.

The Canadian beef industry is much more coordinated than the U.S. industry. The Canadians use video imagery to provide carcass information back to individual producers. Canada is much further down the line with respect to individual animal identification. We have had producers from Canada on NCBA educational programs to help educate our producers to the Canadian model which we think will become more prominent in the future. The changes which are occurring in the United States are not coming without a lot of soul searching and producer unrest in some regions.

PROTECTIONISM

As change take place, agriculture will revisit some of the protectionist issues. Some segments of agriculture, including a meat industry which has traditionally not supported government involvement, will be brought into these discussions.

The protectionist pressures are, in part, responses to other countries' non-compliance with rulings by the WTO. The EU's indication that it might respond within four years to the WTO ruling on the hormone ban adds to confrontation and consternation. Producers question participation in trade agreements if the other parties are not going to comply. The United States has one of the most open beef markets in the world. NCBA's objective is to gain access to emerging international

markets. The EU, by its response, is threatening the role of the WTO as a dispute settlement body. If the EU does not respond and bring its regulations into compliance, the role of the WTO is diminished and could potentially lose its credibility as a dispute settlement mechanism.

Also, in the sanitary and phytosanitary arena, the United States has recognized regions of Uruguay and Argentina as foot and mouth disease-free. Last fall, we recognized Canada as being brucellosis-free. When U.S. shippers try to export feeder cattle to Canada, they still face a complete regimen of testing for brucellosis, tuberculous, anaplasmosis and blue tongue. These impediments exist even though the United States is tuberculous-free, nearly brucellosis-free, and has large regions of the country which are anaplasmosis and blue tongue-free. NCBA has worked to develop a small pilot project involving Montana and Washington to reduce restrictions on U.S. feeder cattle shipped to Canadian feedlots. Until U.S. producers have reciprocal regionalization (recognition of those regions in the United States that are disease-free, so that U.S. feeder cattle can be shipped into Canadian feed lots), we will continue to see pressure for regulations that will slow the shipment of Canadian slaughter cattle into the United States.

TRADE

The United States exports about 8 percent of its beef production. In 1997, about 45 percent of the tonnage and 55 percent of the value of these exports went to Japan. Mexico is our second-largest and fastest-growing export market. Canada is third and Korea is fourth. Korea is now in economic chaos and exports may decline by 50 percent or more, at least in 1998. The United States is still a net importer of beef. In 1996, the United States exported nearly as much as we imported. Canada supplies 33 percent of U.S. beef imports—most of that is grain-fed. Australia and New Zealand each supply about 25 percent. That is mostly lean grinding product. Brazil, Argentina and Costa Rica account for most of the rest.

In addition to meat imports, last year the United States imported nearly 1.1 million slaughter cattle from Canada, about 211,000 feeder cattle from Canada and about 662,000 feeder cattle from Mexico. Traditionally, Mexico has supplied about 1 million feeder cattle. This was as high as 1.38 million feeder cattle in 1995 due to the Peso devaluation and the drought. In 1996, it was about 424,000. In 1998, we expect to import about 800,000 feeder cattle from Mexico. The United States is a net importer of about 6-7 percent of it's beef, if you calculate the beef equivalent of the cattle imported.

The change that trade is bringing about—a more integrated system and becoming more consumer focused—has led to issues including labeling. The USDA Agricultural Marketing Service has announced a certification program to recognize "born, raised and slaughtered in the United States" products. NCBA has policy on the books calling for labeling of imported products. Canadian cattle which are

imported and slaughtered in the United States are counted as U.S. production and are eligible for USDA grade. Under the NCBA proposal, beef from these cattle would be stamped "imported."

Pressures and tensions have increased. As U.S. exports of beef to Mexico have increased, pressures from the Mexican cattlemen for anti-dumping cases and increased reinspection at the border to slow those trade flows have increased. Continuing the communication and working on these issues are keys to sustaining the increased trade flows for our mutual advantage. Educating our producers to understand the net benefits of those trade flows is key.

LOOKING AHEAD

The U.S. beef industry will likely evolve to a two-tier system. We see many alliances evolving. For example, U.S. Premium Beef is aligned with Farmland, and McDonald's has an alliance with a cattle marketer and some feedlots in Texas. Many alliances involve individual animal identification and trace back. All of them involve increased information flows and some type of value-grid-based pricing on the consumer end-product value rather than the production value. There is a sector of the industry which is rapidly moving in the value-grid-based pricing direction and a sector which wants to continue to raise cattle in the traditional manner—hauling them to the market at weaning time or the end of the production cycle, sell those cattle and never see or hear from them again. There will be a two-tiered beef production and marketing system, at least for a few years. Over time, if the Canadian paper is right, the value-based, consumer-orientated, structurally-aligned, more contractual system will prevail, and more and more U.S. beef production will come from that type of system.

For the beef industry, food safety is job one and our top priority. The consumer's right to have a safe and wholesome product is non-negotiable. That is our goal and we are working toward it with Hazard Analysis Critical Control Point (HACCP) programs.

CARGILL LIMITED

Barb Isman

Thank you for the invitation to join you this year as you look for ways to make a positive contribution to our industry. I am particularly pleased that you have also invited my colleague from Saskatchewan Wheat Pool (SWP). I have often thought, when paper after paper has been prepared on the future of the western agricultural industry, that policy analysts might use their time and resources most wisely if they simply talked to three companies: SWP, Cargill and one company not present, Monsanto. Among the three companies, you will capture most of what will happen commercially in the western agricultural sector from a relatively non-academic commercial perspective. I would recommend that you include Monsanto next year.

I will use the time I have to comment most specifically on the Canadian paper—for three reasons. The first is that I have finally learned that it is extremely dangerous to set yourself up as a critic when you know less than either of the presenters or the audience, and that is the case for pork and U.S. beef. Second, even without credentials to comment, I tend to agree with the U.S. paper. Finally, I had intended to make a pitch for further economic analysis on the benefits of reciprocal beef grading, but after talking to Chuck Lambert, I decided that politics, not economics, will prevail on this issue.

In many respects, the paper on structural change in the Canadian livestock industry accurately reflects what is happening in the beef industry. What I will try to add is the "why" to what has and is occurring.

For convenience, I will follow the author's framework, commenting first on trade liberalization. Then, I will share some thoughts on what is described as globalization, particularly as it pertains to meeting consumer demand for specific kinds of product of the highest standards. I will mention briefly how we are doing with Beefworks and Hazard Analysis Critical Control Points (HACCP). I will take the authors to task, just slightly, for their reference to the lack of interface between packers and retailers. Finally, I will comment on what direction processors are moving with respect to research and development.

Trade Liberalization. The authors contend that the Canada-United States Trade Agreement (CUSTA), the North American Free Trade Agreement (NAFTA) and the Uruguay Round were not critical factors in our decision to greenfield the High River plant. That is correct. I would like to tell you what the critical factors were, however, and you will see that they are in a generic sense linked to trade liberalization.

Tom Sporleder identified in his presentation the primary reason for moving into the Canadian market—internationalization. Cargill, during the 1970s and 1980s, had mandated a target of doubling sales every five years. To do that, it was necessary to seek out new locations in which to exploit core competencies—a prime target was meat processing. A second reason for entering the beef market was also related to trade but in a somewhat back-handed fashion. We tried both chicken and pork in the late-1970s and early-1980s and failed because we did not know how to do business in a trade-restricted market. We thought we would have more success with beef because it was not supply managed by government. The final reason we entered the beef business was also trade-related. But again—trade from a perspective not mentioned by the authors—the implications of increased consumer access to competitive products which occurs with trade liberalization.

In the case of the Canadian beef packing industry, there had been shockingly little attention paid to the coming reality of increased import competition. In fact, when we sought out possible acquisitions to enter the market, we were amazed by the antiquity of the Canadian industry relative to the United States. We saw an opportunity to build a new plant capable of serving Canadian consumers cost-effectively and we took it. The only nod we gave to the expanded market opportunity for us as a result of CUSTA / NAFTA / etc. was to make provision in the new plant for a second shift.

To summarize, our decision to enter the Canadian beef business was driven by internationalization, not specifically by recent trade agreements, but rather by generic trade liberalization. Within Cargill, by the way, we actually call internationalization, "globalization." I did not want to do that here because the authors use the term "globalization" slightly differently.

Globalization. Following the author's train of thought—globalization as a driving force to achieve transactional efficiency and to satisfy consumer demand for food quality. There are several comments to make on this point. The first is that the consumer is truly driving this bus—whether or not he or she knows it. Every time chicken is picked instead of beef, or someone buys hamburger, or even thinks twice about buying the hamburger at all, because of E. coli, it has an impact. Product suppliers are being driven to do a better job of meeting their consumer demands.

The consumer is the reason why we are pursuing closer links between the players in the supply chain. So what are we doing? The authors refer to a couple of pieces in the puzzle—formal quality assurance programs in the plant through HACCP and on the farm through initiatives such as Beefworks. But, they have not emphasized two other pieces of the puzzle strongly enough—our involvement as cattle-owners and our work with retailers.

Cattle ownership as well as producer incentive programs will represent an increasing percentage of our throughput requirements over the next five years. I want to add a quick aside on Beefworks—which is in its infancy. As yet, producers have been somewhat slow to respond to the Beefworks program. This may be a result

of the direct relationship between Beefworks and use of our feed company products. Producers are more familiar with and comfortable with our other incentive programs based on weight and grade. This may simply be a function of time—after all the program is new. However, it may be that we will need to reward quality separately from feed purchases for some time to come.

What is to me a missing component in the analysis is the absence of positive reference to linkage up the chain from packer to retailer. For more than three years now, Cargill has been the butcher for National Grocers in Ontario. You will know them better as Loblaws, the largest retail grocer in Ontario.

In this extraordinarily tight strategic alliance, we work for only one customer. Loblaws relies on us to supply packaged case-ready meat products. Why should we respectively put so much at risk? Plain and simply it goes back to the consumer. We are able to utilize economies of scale to produce not only a more cost-effective product, but one which is uniform and wholesome.

This program has been so successful that we are replicating it with Kroeger in the United States. This, we believe, is a trend which will only grow and is part of an evolution from carcass to boxed beef to what is now a finished product. With this kind of linkage, I seriously doubt we will see retailers independently moving down the supply chain to have their needs met. I would only further mention that we do not see a significant expansion in breed-specific product handling. Rather, we see the Triple AAA grade as our most effective tool to satisfy the consumer.

Research and Development. The final piece of the consumer demand puzzle is, in fact, the author's final topic area, research and development (R&D). We have invested significantly in technology such as steam pasteurization and in meeting HACCP requirements. I believe that processors will continue to focus R&D in this area and, at least over the next five years, and will leave biotechnology to others. My only cautionary note to the industry is that this may be a marketing danger, particularly if we allow the scientists to produce that which we cannot sell to consumers, as has been the case with canola.

To summarize, we see two major factors at work in creating structural change in the Canadian beef industry or the "why", if you will:

- First, internationalization—or globalization as we call it—and the choice that brings consumers to prefer Canadian beef.
- Second, the aggressive competitive fight among retailers and packers to be the consumer's choice.

NATIONAL PORK PRODUCERS COUNCIL

Steve Meyer

At the present and into the future, the red meat industry is consumer-driven. In the past that has not been the case. The pork industry has not been consumer-driven, it has been cost-driven. The poultry industry has not been a cost-driven system since about 1982 or 1983. As poultry went through massive rationalization in the 1970s, it was absolutely a cost-driven business as they bought market share every year by learning how to raise birds and process them at lower cost.

The North American red meat industry needs to realize that it is still in the rationalization process. This process is not going to be done on the basis of consumer demand. It is going to happen based on cost. We will pay attention to consumers as long as it does not cost us any money. One of our supply chains' problems is that we get a great deal of lip service from retailers who want quality but will not pay for it. Excel had to sell programs strictly on cost.

Food safety, on the other hand, may drive the industry because the risks are so great. When the packer does a case-ready program for the retailer, it becomes an insurance policy because, if somebody gets sick, it is not the retailer who is going to pay—it is the packer. Food safety is going to drive the meat industry. Without the consumer input, I am not sure the industry would be so motivated.

The Canadian paper was an informative survey of what is going on with the Canadian industry. A U.S. example of the same types of interactions between the processing and retail levels involves Farmland Industries. They have an exclusive arrangement with Hy-Vee stores on a line of pork products that are fresh-processed with a deep-basting technology which seems to be "fail-safe". Ease and convenience in food preparation seems to be what consumers want.

With trade liberalization, our industries are going to become very free-flowing. In 1997, the United States imported over three million hogs from Canada. It will import somewhat less than that this year–with further declines in the years to come. This decline is because the Canadian packing industry will become more competitive. In the process, Canadian producers are going to take part of our market in Japan. The Canadians are also going to start supplying more of their needs at home. The United States will be exporting less pork products to Canada.

U.S. producers have no choice but to compete with efficient producers. Some producers in a few states believe they have that choice. The efficient producers just choose to go to another state or to another country.

Food safety, Hazard Analysis Critical Control Point (HACCP) programs, and "trace back" are all important. U.S. producers have a voluntary producer certification program called Pork Quality Assurance. I know that Canada is embarking on a similar program. A challenge for both of us is to make these programs mesh. For instance, a U.S. packer in Minnesota, starting next January, will not buy anything except our highest certification level pigs. As more and more of our production meets those specifications, other plants are going to begin requiring the highest level of pork quality assurance. They are not necessarily going to pay for it—just require it. Consumers should not have to pay for a safe product either. They deserve a safe product.

Pork is one of the most protected, restricted products in international trade. Two percent of the world's production is traded. More pork is consumed in the world than any other meat product by a factor of about two. Yet, there are all of these roadblocks to trading pork around the world. NAFTA and WTO will help somewhat. Still, those tariffs do not come down very quickly.

David Anderson mentioned a number of factors which are important in the North American pork sector. There are several reasons for the increase in market weights—very good genetics and plant operating costs being the main ones. One other reason for increased weight is that some producers have not figured out the right objective function in hog production. They still maximize profit per head when they should be looking at profit per day. Many times, hogs are fed too long. Similarly, capital-intensive time-dimensioned production systems feed hogs 18 weeks and sell them on the eighteenth week regardless of what they gross. That happened this spring when weights rose dramatically as prices were going down. Part of the reason for this situation was that those hogs performed so well over the very mild winter in our major growing areas that they ended up heavier in a given number of weeks. The market did not need this extra weight.

Productivity is increasing rapidly. In 1970, the United States produced 1,500 pounds of carcass pork per breeding animal. Last year, it produced just over 2,500 pounds per breeding animal. We are really proud of that accomplishment. But, the best 10 percent of our operations produce 5,000 pounds per breeding animal. Many producers are not doing very well.

Larry Martin indicated that production costs in Canada are much lower because Canada does not have the grain and transportation subsidies any longer. I believe it is because Canadians have better technical efficiencies. As our industry consolidates, the United States will reduce its production costs and, in the end, they will be very close to those of Canada. On the other hand, as your packing industry consolidates and modernizes and gets larger plants, Canada will eliminate its cost disadvantage in packing costs. Canada has a very competitive industry in which there will be a packer shake out. As long as there is a border between our two countries, it will overlap and be very competitive all the way through.

The Paul Engler comment concerning feed as a factor influencing the location of cattle feeding was very interesting. However, it is not necessary to have feed at your back door. North Carolina is proof of that. What it had was three advantages: new technologies, entrepreneurial spirit, and necessity. They knew they had to have something to supplement the income of tobacco in North Carolina. The Extension Service asked, "Why can't we raise hogs?" Two or three guys took the leadership role and created an industry. These producers became so big that they had cost advantages.

The environment is a social issue. Social issues as well as economic issues have to be addressed. The new costs imposed from environmental solutions will be significant, but they will not be huge. These costs are being added to an industry which has been the most profitable of all the agricultural industries outside of poultry.

From a trade policy perspective, the countervail was zero last year and it will be the same this year. It will still stay on the books, but not come into play.

For the Mexican pork industry, it is in all of our best interests to work cooperatively in North America. Your hog numbers have fallen in the last few years, especially since the devaluation of the Peso. The number of producers has fallen as well. There are interesting things going on with the regionalization concept in Sonora. Mexico increased exports to Japan by 120 percent last year. They are raising a speciality product just to ship to Japan. We should not leave Mexico out of this discussion even though the current strength in the pork industry is in the United States and Canada.

Similarly, do not forget South America. A Western Hemisphere trade agreement will take advantage of grain grown very efficiently in South America. Producers in the United States are looking very seriously at starting operations in South America. Major investment will take place, when the risk factor in South America gets to a manageable level.

CANADIAN PORK COUNCIL

Martin Rice

I am going to start with a few comments on the Anderson et al paper. Tension between the U.S. and Canadian pork producers has declined considerably. When the countervail came up ten years ago, the U.S. leadership looked at the United States as its market. Therefore, any product coming into the United States was looked upon as displacing a U.S. product. Now, as a net exporter, the U.S. market is the world. The United States looks at imports from Canada much differently now. Packers in the Northern states now look at live hogs coming in from Canada as helping them keep their plants running. It is quite a different set of circumstances now than we had ten years ago.

On the demand issue, Canadian pork consumption has been relatively flat. Unlike the United States where per capita meat consumption is still increasing, per capita meat consumption in Canada has been declining. As a result, with flat pork consumption, pork has been able to increase its market share. It is in pork's best interest that Canada keeps its poultry supply management program through the next World Trade Organization (WTO) round. Our per capita poultry consumption is considerably below the United States. This contributes to pork's higher market share.

Anderson indicates that U.S. producers have responded to packer signals to increase carcass weights. In Canada, it has been the opposite. Canadian producers have been pressing packers to accept higher carcass weights since the grading system was established in 1968. Canada is still averaging 25 pounds or 10 kilos less than a U.S. hog. We can add more weight to those animals, since there is a higher return to the producer from finishing than in feeding new piglets. It has only been since the increased flow of live hogs to the United States, that Canadian packers are now having to accept higher weights. I think that the higher hog weights desired by the United States are perhaps the most attractive feature of that market. Canadian packers now have to look at accepting heavier hogs as a way of retaining more of those pigs for their use in Canada.

Canada is now the number four exporter of pork in the world. If we slaughtered more of our pigs in Canada, we would probably be number two. A chart in Anderson's paper indicates that exports to the United States account for 70 to 80 percent of our pork exports. Canadian data shows quite a different story. In 1991, 75 percent of our pork exports by volume went to the United States. In 1997, this figure was down to approximately 50 percent of our pork export volume. The Canada-United States Trade Agreement (CUSTA) took affect in 1989 and was the year when the last pork countervail investigation took place. As a result of that

countervail, the Canadian industry decided that it must become less dependent on the U.S. market. Consequently, when we went into CUSTA, we set an opposite course from that pursued by most other Canadian industries—to be less dependent on the U.S. market.

I agree that differences in costs of production between the United States and Canada are small. The North American industry—including Northern Mexico—is in an excellent position to increase its share of the world pork market. Cost differences between Canada and the United States are fairly unimportant in explaining our future in the world market.

From literature read, I have always assumed free trade agreements, trade liberalization or removal of trade barriers forces industries to either make adjustments or compete. The real adjustments in the Canadian industry are just now happening—in the last year or so—even though we have had CUSTA and now the North American Free Trade Agreement (NAFTA) for nine years. I suspect that one of the reasons may be the exchange rate. When CUSTA went into effect, the Canadian dollar was well over 80 cents on the U.S. dollar and now it is at 70 cents. That has shielded Canadian packers from their higher labor costs (when you adjust for the exchange rates). If we had a 90 cent Canadian dollar, Canadian labor costs would be far out of line. Pressure for Canadian industry to assure that more and more Canadian hogs did not go to the United States has forced packers to look at heavier weights and ways to rationalize their operations to be competitive.

Comments on the Hobbs and Kerr Paper

Moving on to the Canadian paper, the first page indicates that the Canadian agribusiness community has moved into a state of disequilibrium. The Canadian industry has always been unstable. While we have had cyclical variations, the width of the variations has become greater. Even though our demand for North American pork has become much more globalized with the reduction in trade barriers, we still have to absorb a large, disproportionate share of the adjustment in the world pork supply. Europe, for instance, will throw up an export tax on grains to stabilize their supplies. If, all of a sudden, the internal price of grain goes up, they tax it so that they can protect their domestic livestock industry. There are variable import levies in Europe and certainly many trade barriers in Asia.

The North American industry has to absorb all of the downside supply adjustment. In addition, the decision to build more hog farms is more complicated and involves more parties. Credit institutions play a larger role now in terms of how soon new units can be built in response to increasing prices. The exception, perhaps, is Murphy Family Farms which has been able to generate so much of their expansion from internal retained earnings. That is not the case for most of the industry, but particularly for new producers.

Information is becoming more difficult to come by for producers. Marketing boards are probably going to have to be called something else. Many of them are carving out the marketing aspect and concentrating on other issues.

One of the difficulties in determining the impact of trade liberalization agreements is when a trade agreement leads to dialogue between countries which did not previously communicate. Before NAFTA, Canadian pork producers never had contact with the Mexican pork producers. Now, we meet with them twice a year. We may not eliminate non-tariff barriers, but we find ways of handling them so they are less irritating. Border inspection is no longer an issue, as it was during the negotiations.

With globalization, it is much more difficult for countries to pursue targeted economic development strategies. Asia's problems are a result of channelling low interest credit to certain industries, maintaining high tariffs on certain imports and exchange rate management. These macroeconomic strategies are becoming much more difficult due to globalization, trade agreements and investment agreements.

There is an indication in the Canadian paper that the Uruguay Round did not impact greatly on pork exports. I would differ on this point. The Korean and Philippine markets did not exist for Canada before the WTO. Sales to Japan have increased because of decreasing their minimum import price under the WTO. The existence of the sanitary and phytosanitary agreement is a major accomplishment. The prospect of having dispute settlement procedures has helped Canada open markets to Argentina and to secure access to Australia. They know that under a dispute panel, they would not fare very well.

Hopefully, we are going to be successful in securing further trade liberalization. There are three huge questions in the upcoming negotiations:

- Can we get terms of access for China in the WTO that are acceptable to the livestock industry?
- Can we maintain a science-based approach in our sanitary and phytosanitary agreements?
- Can we finally achieve the goal of eliminating export subsidies?

AN OVERVIEW OF SOME OF THE COMMENTS FROM THE GENERAL DISCUSSION

- To the extent that genetically modified organisms (GMOs) are going to be part of the food chain in the next twenty years, farmers' ability to negotiate may become a moot point. They may not own the product they are producing. Poultry is as an example—you do not really negotiate for a price if you sign a Tyson's contract. I am not sure of the extent we can couple a tightly integrated vertical system with an old idea of farmers knowing what a fair price is. One of the larger issues now is who will control agriculture. It is an old issue, but it is much more of a policy issue now than it was thirty years ago.
- National Pork Council members come to me all of the time and ask about open market access. I think open market access is a meaningless term; it only applies to commodities. Once you differentiate a product, no one is guaranteed open market access. If I want to make carburetors, that is fine, but I am not guaranteed anyone will be there to buy them unless I have a contract. That is the same type of concept we are getting in agriculture with differentiated products. Hopefully, our products will have better returns because of technological innovation. Deciding how to share the returns will be the issue. We are missing the boat on GMOs. Companies are not going to put GMOs out in the public sector. They are going to contract with somebody to produce GMOs all the way through the market channel and control the end product. There will be no such thing as open market access in a classical sense.

STRUCTURAL DEVELOPMENTS IN THE MEXICAN GRAIN-LIVESTOCK SUBSECTOR: THE GRAIN AND OILSEED SUBSECTOR

Beatriz Avalos-Sartorio

INTRODUCTION

Population growth and changes in eating habits constitute the forces behind the country's fast-growing feed industry. Mexico's annual consumption of livestock products—meat, dairy products and eggs—grew by 3.2 percent annually during the past seven years, and reached 17 million tons during 1997. This rapid growth in consumption has ensued from a rapidly expanding population and from a fast-growing per-capita consumption. The country's population, now 96 million, grew by 1.96 percent annually during this period. Meanwhile, per-capita yearly consumption of livestock products went from 161.5 kilos in 1990 to 176.1 kilos in 1997, in spite of its significant drop in 1995 and 1996 for most products as a result of the economic crisis.[1]

The rapid growth in the consumption of livestock products has caused rapid expansion of the domestic demand for feed. Nationwide apparent consumption of feed has grown by 3.4 percent annually since 1990, and reached 15 million tons[†] per annum in 1997. Practically all of the demand has been satisfied by domestic production. The industry has, however, become increasingly dependent on imports to meet its expanding demand for grains and oilseeds.

This paper first describes the Mexican feed industry today, and discusses its evolution in recent years. Next, it reviews the importance that the main grains and oilseeds have as inputs in the industry, and the role of imports in the satisfaction of the industry's demand for these products. In order to assess the strength of the linkage between imports of each feed grain/oilseed and the domestic feed industry, the annual volume of imports of individual products since 1990 is regressed linearly

[1]These are the author's calculations with data from Conapo-PEF (1995) and Canacintra (1998).
[†]Author's note: "tons" refers to metric tons.

against volumes produced in the industry. The regression coefficients indicate the expected change in the volume of imports of a grain / oilseed (in tons), for every additional ton of feed produced.

Recent changes in policy, geared towards a greater role of markets and improved productivity, are affecting the supply and demand of grains and oilseeds. Policy changes are briefly discussed in the third section of the paper. A description of the recent evolution of each crop's competitiveness, based on survey data from FIRA, a Mexican development bank specialized in lending to commercial producers, is presented in the fourth section of the document. The paper ends with a summary and conclusions.

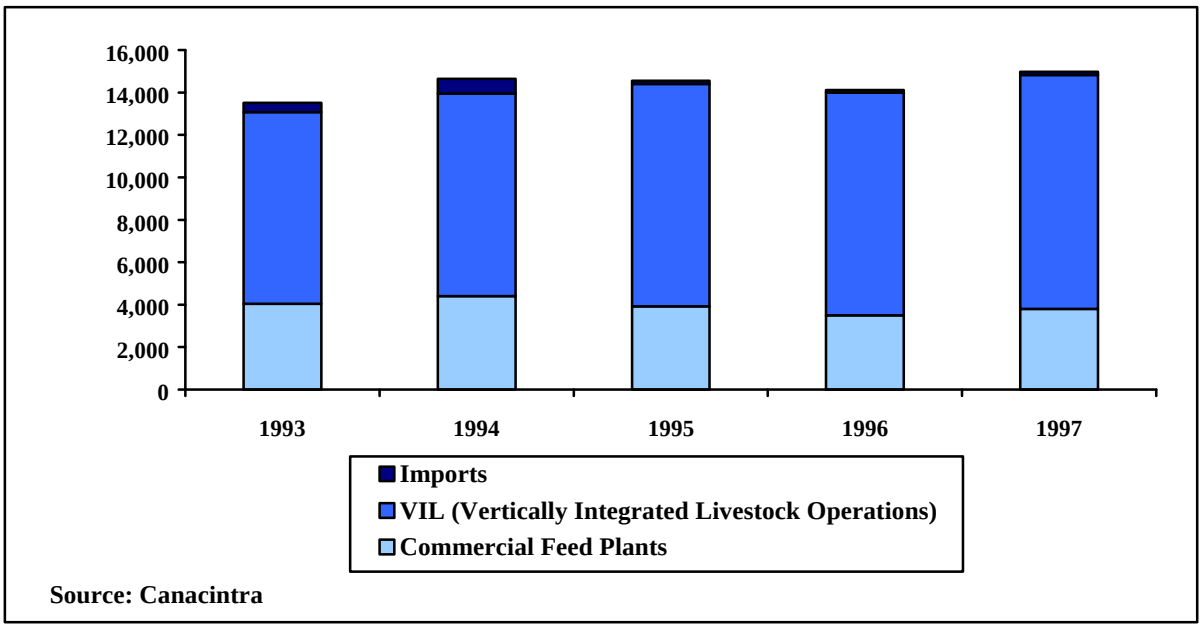
THE MEXICAN FEED INDUSTRY

According to the Mexican Chamber of the Manufacturing Industry (Canacintra) (1998), Mexico's domestic feed production reached roughly 14.8 million tons in 1997, a 6 percent increase over 1996. Based on data from the Mexican Statistics Institute (INEGI, 1997) on volume (which grossly underestimates Canacintra's), the average sales price in 1997 was US$250 per ton.[2] Canacintra's volume valued at INEGI's average price implies a value of sales for 1997 of US$3.708 billion.

Compared with commercial feed plants, vertically-integrated livestock (VIL) operations have been better able to survive the input and output price adjustments brought about by trade liberalization and by the recent economic crisis. The industry has, therefore, experienced a drastic restructuring in the past decade and a half. While a decade and a half ago VIL operations produced only 30 percent of the country's feed, today their share is 74 percent (Figure 1). The significant drop in production in commercial operations during 1995 and 1996, not evident in VIL operations, suggests that livestock producers started their own feed production plants as a survival tactic in response to the recent slump in demand for some livestock products, increased import competition, and high inflation.

[2]INEGI reports a volume of 5.584 million tons for 1997.

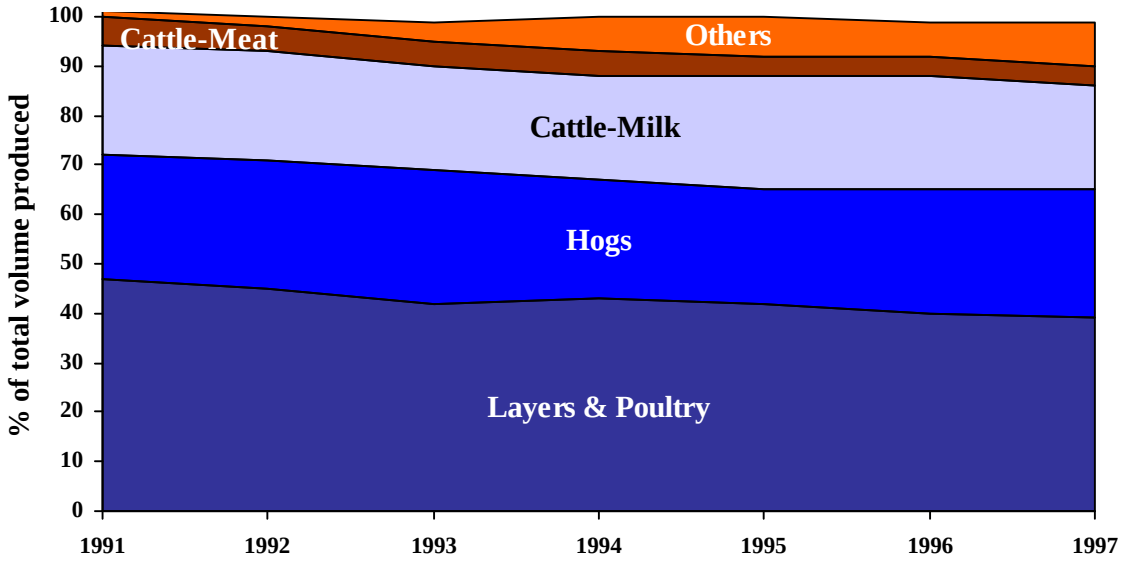
Figure 1: Apparent Consumption and Sources of Feed in Mexico, 1993-97



According to INEGI (1995), there were 442 feed manufacturing plants in Mexico in 1994. Five of these were "big-sized" (with 251 or more employees each, and individual average annual sales of US$22.8 million each); 20 were "medium-sized" (with 101 to 250 employees, and average annual sales of US$27.0 million each); 182 were "small-sized" (with 16 to 100 employees, and average annual sales of US$7.6 million each); and 234 were "micro-sized" (with 15 employees or less, and average annual sales of US$157 thousand). Although more recent estimates from INEGI are not available, Canacintra's records indicate a total of 360 feed plants in Mexico for 1997, with a total installed capacity of 20 million tons annually, 26 percent which remained idle that year. According to Canacintra, VIL operations comprise two-thirds of the industry's installed capacity. In 1997, smaller-sized plants, usually VILs, were operating on 92 percent of their installed capacity, which contrasts with the underutilization of the larger-sized commercial plants, which last year operated at an average 48 percent of their installed capacity.

In 1997, the Mexican feed industry delivered almost 39 percent of its output to producers of layers and poultry, 26 percent to pork producers, 21 percent to bovine milk producers, and 4 percent to beef producers. Feed-to-meat (milk) conversion ratios were 2.340, 3.415, 0.333, and 0.942, respectively. The remaining 9 percent of output was bought by ovine, caprine, and aquaculture operations, or by manufacturers of pet food (Canacintra, 1998; Figure 2).

Figure 2: Percent Share of Volume Produced by the Mexican Feed Industry, by Type of End User, 1991-97



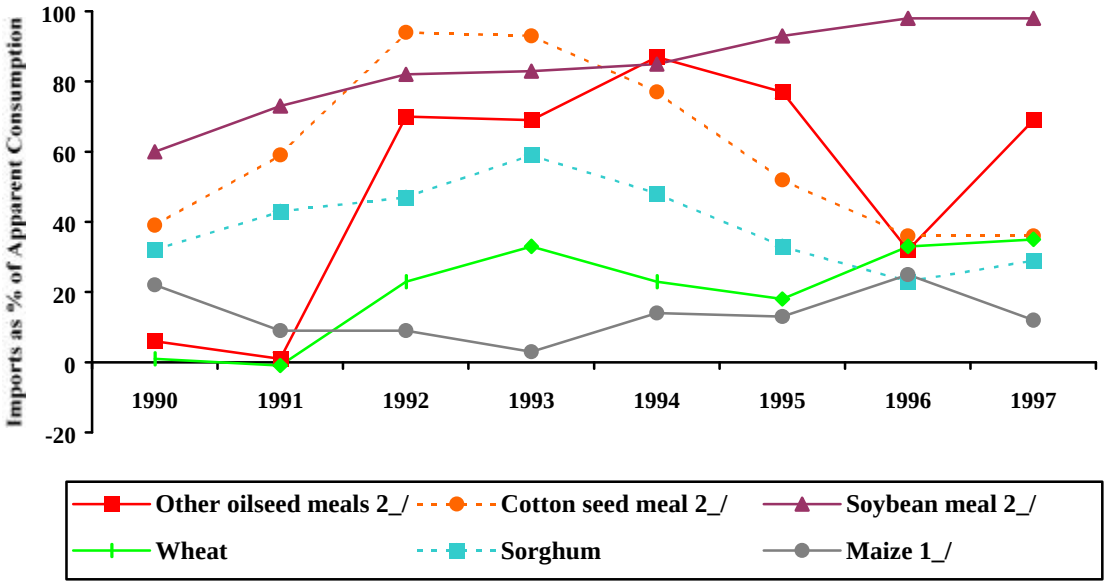
Source: Canacintra

Mexico's domestic feed production satisfies practically all of domestic demand. In 1997, imports represent only 1 percent of domestic utilization. But the industry imports an important share of its intermediate inputs. According to INEGI (1997) intermediate input costs represented 83 percent of the value of the feed industry's sales that year, and based on Canacintra's data on the volume of sales and INEGI's average price, such costs reached US$3 billion. INEGI-STPS[3] (1995) reports that in 1994, the total cost of imported intermediate inputs for the industry was 12 percent of the industry's intermediate input costs that year. If this same share is assumed for 1997, it implies imports of intermediate inputs worth US$369 million.

The feed industry's main inputs are grains, oilseeds and their subproducts, and for many inputs there is a strong import dependency. According to INEGI (1994), grains, oilseeds and their subproducts constituted 85 percent of the volume and 69 percent of the value of the typical feed mix in 1993. According to Canacintra (1998), the share of grains and oilseeds in the volume of output averaged 62 percent and 15 percent, respectively, during 1996-1997. As shown in Figure 3, imports in the last two years supplied a fifth of the domestic apparent consumption of sorghum, 98 percent of that for soybean meal (imported as whole soybeans or as meal), over a third of that for cottonseed meal (imported as whole cottonseed or as meal), and over half of that for other oilseed meals (imported as whole seeds or as meals).

[3]STPS stands for the Mexican Ministry of Labor.

Figure 3: Mexico's Import Dependency for Main Feed Grains and Oilseed Meals, 1990-97



Sources: Bancomext, INEGI, SAGAR

1_/includes imports of whole and broken maize.
2_/includes imports as seed (in meal equivalent) and as meal.

Feed Grains

Grains and their subproducts are the main inputs to Mexican commercial feed mills and VIL operations. In the typical feed mix, these products constitute 71 percent of the volume of the industry's intermediate inputs and 27 percent of the cost. In 1993, for example, the industry used at least 3.48 million tons of grains and their subproducts, at a cost of US$613.3 million (INEGI, 1994).

Maize. According to INEGI (1994) Maize and its subproducts constitute 14 percent of the volume and represent 10 percent of the cost for the typical feed mix. INEGI reports that, in 1993 the industry used 707 thousand tons of maize and its subproducts, at a cost of US$170 million. However, given the pervasive use of maize as feed in backyard operations, INEGI's figures are, no doubt, lower bounds on the volume and cost shares of maize and its products used as feed.

Table 1 shows Mexico's sources and use of maize since 1990. Domestic production has been remarkably stable, in spite of the significant drop in domestic prices since 1994, but the country's apparent utilization has risen sharply.[4] The increasing deficit has been supplied by imports, which have undoubtedly risen as a result of the

[4]The growth can be attributed in part to the drop in prices, in part to a higher per-capita consumption—the result of the drop in the population's purchasing power of higher-priced foods brought about by the economic crisis—and in part to the growth of the country's population.

North American Free Trade Agreement (NAFTA). Imports averaged 3.6 million annually in the last three years, compared with 2.3 million in the first three years of the decade.

Table 1: Mexico's Domestic Production and Imports of Maize (Whole and Broken), 1990-97

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
	Thousand Metric Tons							
Imp broken	37	39	351	323	280	68	82	63
Imp whole	4,089	1,398	1,283	163	2,710	2,636	5,818	2,469
Production	14,635	14,252	16,929	18,125	18,236	18,353	18,026	18,779

Source: Bancomext, INEGI, SAGAR

The strength of the link between imports of maize and the domestic feed industry can be assessed by regressing the volume of imports of maize and its sub-products against the volumes of feed produced commercially and by VIL operations. Results from a regression that considers the 1990 to 1997 period do not suggest a strong link between imports of whole maize and the feed industry (see Table 2). However, they do indicate a strong link between imports of broken maize and volumes feed produced commercially, and between imports of maize gluten and feed produced both by commercial and by VIL operations. The estimated parameter for each independent variable indicates the expected increase in the volume of imports (in tons) associated with every additional ton of feed produced in any given year.[5]

Table 2: Imports of Maize and Maize Products as Linear Functions of Feed Produced Commercially and by Vertically-Integrated Livestock Operations, 1990-97

Product/Parameter values	*Constant*	*Commercial*	*Integrated*	R^2
Maize	10,910	-3.290	0.472	
"t" values	**(6.90)	(-1.78)	(0.87)	0.42
Broken maize	-1,075	0.352	-0.015	
"t" values	**(-12.06)	**(3.39)	(-0.50)	0.70
Maize gluten	-63	0.030	0.007	
"t" values	(-0.15)	**(4.78)	**(3.53)	0.89

** = coefficient is significant at $\alpha = 0.01$.

Notwithstanding the lack of a strong link between imports of whole maize and domestic feed production suggested by this regression analysis, there is evidence that, at least recently, a significant share of imports of maize has been utilized as feed,

[5]In interpreting the coefficients, the reader should keep in mind that many products are processed before they are incorporated to feed mixes, and lose part of their volume in the process. The reader should also keep in mind that official data on volume of feed produced are surely underestimates of actual volumes, and therefore reflect only part of the derived demand for grains and oilseeds from the feed industry.

and that the share will rise in the future. According to Canacintra (1998b), out of total whole maize imports carried out in 1997 within the NAFTA quota (2.5 million tons), 21 percent (514.8 thousand tons) were assigned to livestock producers or to the commercial feed industry. For 1998, 1 million tons, roughly 40 percent of the NAFTA quota, have been pre-assigned to both of these users.

Sorghum. Sorghum is by far the main input in the Mexican feed industry by volume and by value. According to INEGI (1994), sorghum constitutes 50 percent of the volume of intermediate inputs and 24 percent of their cost in the typical feed mix. In 1993, the industry purchased 2.437 million tons of sorghum, at a cost of US$377 million. Roughly 20 percent of the sorghum is used by commercial feed producers; the remaining 80 percent is used by VIL producers (ASERCA, 1997d).†

Mexico is the major sorghum importer globally. On average, from 1992 to 1996, its imports constituted 41 percent of total world imports. However, as shown in Table 3, the country's domestic production has been increasingly able to supply the domestic market, as its falling trend during the three years of the decade have reverted to a sharply-rising one starting in 1994. Today, sorghum imports represent only a fourth of domestic apparent use, compared with an average 40 percent during the first three years of the decade.

Table 3: Mexico's Domestic Production and Imports of Sorghum, 1990-97

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
	Thousand Metric Tons							
Imports	2,861	3,200	4,727	3,745	3,473	2,092	1,983	2,189
Production	5,978	4,308	5,353	2,581	3,701	4,170	6,610	5,490

Source: Bancomext, INEGI, SAGAR.

The strength of the link between sorghum imports and the domestic feed industry can be assessed by regressing the volume of imports against the volumes of feed produced. The results suggest a very strong link between imports of sorghum, and the volume of feed produced by commercial operations (see Table 4). The estimated parameter for each independent variable indicates the expected increase in the volume of imports (in tons) associated with every additional ton of feed produced at any given year. Since sorghum is not processed in any way that reduces its volume, we would have expected the estimated parameters to have values that are less than 1.0. A plausible explanation for the large (> 1) coefficient associated with commercial feed volumes and the negative coefficient associated with volumes produced by VIL operations is that the VIL operations purchase imported sorghum from commercial operations as their sorghum requirements increase. (See also footnote 5.)

†Editor's note: For an explanation of ASERCA, see page 174.

Table 4: Imports of Sorghum as a Linear Function of Feed Produced Commercially and by Vertically-Integrated Livestock Operations, 1990-97

Product/Parameter values	*Constant*	*Commercial*	*Integrated*	R^2
Sorghum	-502	2.060	-0.473	
"t" values	(-0.86)	**(3.02)	(-2.37)	0.73

** = coefficients are significant at $\alpha = 0.01$.

Wheat. According to INEGI (1994), wheat and its products constitute 7 percent of the volume of intermediate inputs and 3 percent of their cost in the typical feed mix. In 1993, the industry purchased 326 thousand tons of these products, at a cost of US$49 million.

Mexican millers classify wheats into five groups, based on its gluten properties. Groups I and II are soft wheats, used for bread-making, and groups III to V are used in the cookie and pasta industries, and are preferred as feed due to their lower price.[6] In Mexico, since the early 1990s there has been a drastic shift toward the production of the harder wheats in groups III to V. This shift has been due to problems with Karnal Bunt in bread wheats. While in 1993 wheats in groups III to V comprised 53 percent of production, their share had risen to 69 percent by 1996. As a result of this shift in output mix, the domestic demand for soft wheats has been increasingly satisfied by imports, which have tripled since 1991, and the domestic surplus of hard wheats has resulted in substantial exports. In 1995, exports of durum were boosted to a record 453 thousand tons by a devalued peso and a low supply of hard red Winter wheats in the U.S. Exports averaged 100 thousand tons in the last two years (ASERCA, 1997f). Figure 4, shows the evolution of domestic production and imports since 1990. The drop in domestic production since 1994 combined with a rise in demand has resulted in a shift from a situation of practical self-sufficiency at the beginning of the decade, to one in which a third of domestic consumption is supplied by imports.

The strength of the link between wheat imports and the domestic feed industry is assessed by regressing the volume of imports against the volumes of feed produced. Results in Table 5 suggest that VIL producers are important buyers of imported wheat. They will likely buy 495 additional kilos of imported wheat for every additional ton of feed that they produce.

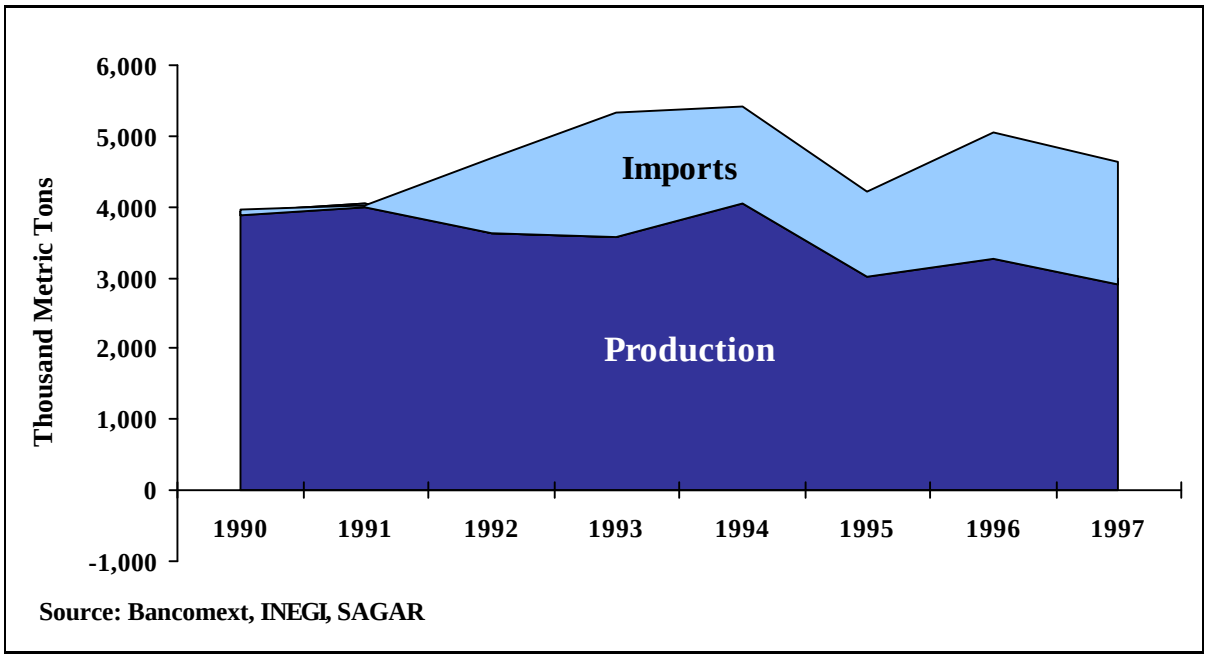
Table 5: Imports of Wheat as a Linear Function of Feed Produced Commercially and by Vertically-Integrated Livestock Operations, 1990-97

Product/Parameter values	*Constant*	*Commercial*	*Integrated*	R^2
Wheat	-5,525	0.496	0.495	
"t" values	**(-11.83)	(0.91)	**(3.11)	0.69

** = coefficients are significant at $\alpha = 0.01$.

[6] In 1996, for example, bread wheats sold at a premium of 20 to 25 percent over durums.

Figure 4: Mexico's Domestic Production and Imports of Wheat (Whole and Broken), 1990-97



Oilseeds and Subproducts

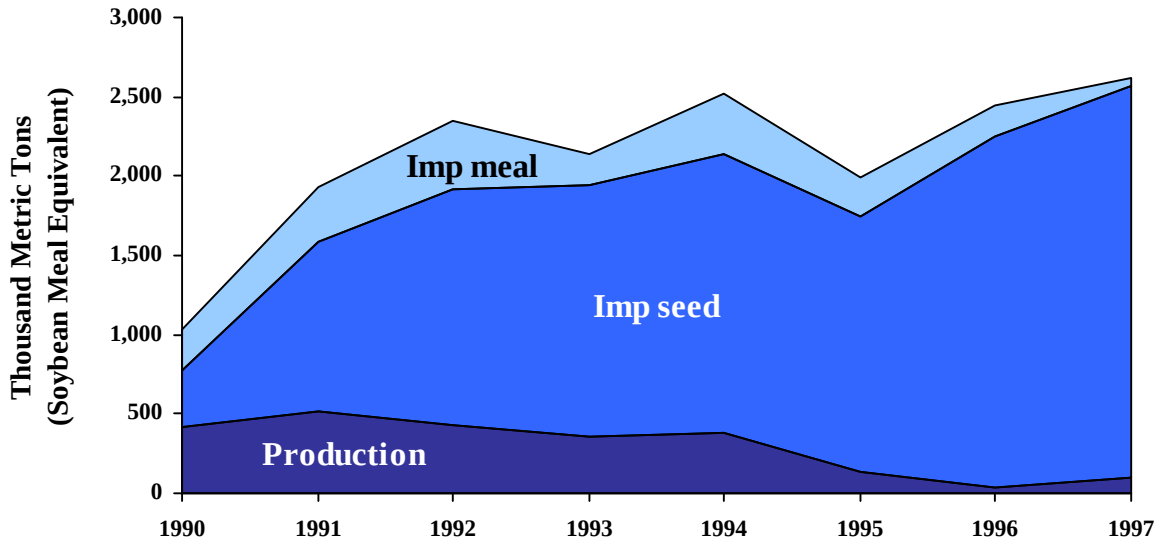
Oilseeds and their subproducts are also major inputs for the industry. According to INEGI (1994), they constitute 14 percent of the volume and 27 percent of the cost of the typical feed mix. In 1993, the industry purchased 696 thousand tons of oilseeds and their products, at a cost of US$382.4 million, mostly from imports.

Soybeans and Soybean Meal. Soybeans and soybean products are the second most important input in the Mexican Feed industry after sorghum, and by far the main oilseed ingredient. According to INEGI (1994), soybeans and its subproducts (meal and oil) constitute 14 percent of the volume and 22 percent of the cost of the typical feed mix. In 1993, the industry bought 682 thousand tons of these products, at a cost of US$347 million.

As shown in Figure 5, Mexico's soybean production has fallen significantly during the 1990s. Harvested surfaces and yields have been reduced drastically due the combined effects of water scarcity in the Northwest, white fly infestations, and a drop in real prices. Domestic apparent use (in soybean meal equivalent), which has risen by an average 14 percent annually since 1990, has been increasingly supplied by imports of soybeans and soybean meal. The country's dependency on imports of both products has gone from 60 percent in 1990 to 97 percent in the period 1996-97. Today, soybeans constitute 73 percent of the value of total Mexican oilseed and oilseed product imports (ASERCA, 1997a). The fact that most soybeans are imported whole, increasingly so in the post-NAFTA years, is probably due to the lower tariff on whole soybeans than on meal.

The link between soybean and soybean meal imports, and the domestic feed industry suggests that the strongest links lie with whole soybean imports, from demand by VIL producers (see Table 6). The coefficients suggest that each additional ton of feed produced by VIL operations is associated with 725 kilos of additional soybean imports, or 468 additional kilos of meal imported either as whole soybeans or as meal.

Figure 5: Mexico's Domestic Production and Imports of Soybeans and Soybean Meal, 1990-97



Sources: Bancomext, INEGI, SAGAR

Table 6: Imports of Soybeans and Soybean Meal as Linear Functions of Feed Produced Commercially and by Vertically-Integrated Livestock Operations, 1990-97

Product/Parameter values	*Constant*	*Commercial*	*Integrated*	R^2
Soybeans	-5,925	0.304	0.725	
"t" values	**(-14.25)	(0.63)	**(5.11)	0.85
Soybean meal	44	0.213	-0.064	
"t" values	(0.47)	(1.92)	(-1.99)	0.58
Soybeans + meal (meal equivalent)	-4,217	0.408	0.468	
"t" values	**(-14.12)	(1.17)	**(4.59)	0.83

** = coefficients are significant at $\alpha = 0.01$.

Cottonseed and Cottonseed Meal. According to INEGI (1994), cottonseed and its sub-products (meal and oil) constitute 0.06 percent of the volume and 0.12 percent of the cost of the typical feed mix. The feed industry bought 2.8 thousand tons at a cost of US$1.8 million in 1993. However, regression analysis conducted by the author for the

period 1990 to 1997 suggests that INEGI's figures may be grossly underestimating the importance of cottonseed and meal as feed ingredients. Results of the analysis, shown in Table 7, indicate that every additional ton of feed produced commercially has been associated with an additional 146 kilos of imports of cottonseed meal equivalent (imported either as cottonseed or cottonseed meal). These results not only suggest a relatively strong linkage between imports of these products and the domestic feed industry, but also establish a lower bound on their share in the volume of the typical feed mix that is much higher than the one suggested by INEGI**.**

Table 7: Imports of Cottonseed and Cottonseed Meal as Linear Functions of Feed Produced Commercially and by Vertically-Integrated Livestock Operations, 1990-97

Product/Parameter values	*Constant*	*Commercial*	*Integrated*	R^2
Cottonseed	-479	0.212	-0.027	
"t" values	**(-12.47)	**(4.73)	(-2.04)	0.83
Cottonseed meal	-155	0.054	0.001	
"t" values	**(-9.29)	(2.79)	(0.13)	0.61
Cottonseed + meal (meal equivalent)	-361	0.146	-0.011	
"t" values	**(-11.57)	**(4.00)	(-1.01)	0.77

** = coefficients are significant at $\alpha = 0.01$.

The drastic changes in domestic cotton production, which have resulted in an equally unstable domestic production of cottonseed, explain the high variability of cottonseed imports. The degree of dependency on imports of both products has shifted significantly during the 1990s, from 39 percent in 1990, up to 94 percent in 1992, and down again to 36 percent during 1996 and 1997. Imports were reduced to almost zero in 1996 and 1997 due to the boom in domestic cotton production that began in 1994 as a result of favorable world prices. Compared to cottonseed imports, those of cottonseed meal have remained relatively stable.

Other Oilseeds and Oilseed Meals (Canola, Safflower, Linseed, Sesame). According to INEGI (1994), other oilseeds and oilseed meals constitute 2.6 percent of the cost of the typical feed mix. The industry spent US$40 million on purchases of these products in 1993. Domestic apparent use, although highly variable, has grown at an average 10 percent annually since 1990. Although the downward trend in domestic production during the early years of this decade reverted to an ascending one since 1995, domestic demand has been increasingly satisfied by imports. In 1997, 69 percent of the domestic consumption of these oilseed meals was supplied by imports. Due to tariff escalation, almost all imports were in the form of seed, instead of meal.

Regression analysis conducted by the author for the period 1990 to 1997 suggests that the links between imports of these other oilseeds and the feed industry are relatively weak (Table 8). The results suggest that the demand for imports may be coming mainly from the food sector. Within the feed industry, commercial operations seem to be the main users.

Table 8: Imports of Other Oilseeds and Oilseed Meal as Linear Functions of Feed Produced Commercially and by Vertically-Integrated Livestock Operations, 1990-97

Product/Parameter values	*Constant*	*Commercial*	*Integrated*	R^2
Canola seed	-1,821	0.295	0.091	
"t" values	**(-14.50)	(2.01)	(2.12)	0.65
Other oilseed seed meals	-105	0.023	0.003	
"t" values	**(-10.78)	(2.02)	(0.92)	0.52
Other oilseeds + meal (meal equivalent)	-1,198	0.200	0.058	
"t" values	**(-16.78)	(2.40)	(2.36)	0.71

** = coefficients are significant at $\alpha = 0.01$.

AGRICULTURAL POLICIES

Recent changes in policy, geared towards a greater role of markets and improved productivity, are affecting the supply and demand of grains and oilseeds. Following is a brief description of the main programs and policies.

Alianza para el Campo[7]

The Alianza para el Campo support program was negotiated with producers in October 1995, with the main goal of increasing the agricultural sector's productivity. The program started operating in the first months of 1996. It is cofinanced by the Federal government, which contributes 32 percent of the cost; state governments that furnish 18 percent; and producers, who provide the remaining 50 percent of the funds. Funds are deposited in ad hoc state trust funds (FOFAE). The twenty-three specific programs of Alianza para el Campo, which operated during 1996, had increased to more than 50 by the end of 1997.

Each FOFAE is managed by a Technical Committee, according to rules of operation established in the technical specifications for each specific program. Programs are decentralized so that their operation is coordinated by the Mexican Ministry of Agriculture (SAGAR) regional offices (DDRs), along with state governments. Producers can finance the programs either through their own resources, through credit, or through the transfer of their rights to future PROCAMPO payments.[8] The total

[7]"Alianza para el Campo" means, literally, alliance for the countryside.
[8]See next section for an explanation of PROCAMPO.

cost of the program in 1996, including producers' contributions, amounted to 3.764 billion pesos (US$495 million), and, according to Ministry of Agriculture (SAGAR) estimates, it benefited 2.1 million producers that year. The specific programs within Alianza para el Campo that have affected the grain-livestock subsector most directly are those to promote mechanization, oilseed production, and the purchase of improved maize seeds. Each of these programs is described briefly below:

- The program to promote mechanization includes discounts on the purchase of agricultural tractors and precision drills produced domestically, and a subsidy by Federal and state governments on the purchase price. Producers under this program end up purchasing a new tractor or precision drill at roughly half the price of similar imported machinery. The program also includes a subsidy on the purchase of spare parts to repair old machinery. SAGAR (1996) estimated that by the end of 1996, 11,176 tractors and 729 precision drills were bought or repaired under the program. Federal and state government spending by the end of 1996 amounted to 206 million pesos (US$27 million), and is estimated at 230 million pesos (US$29 million) for 1997, to support the purchase or repair of 10,185 tractors and 1,850 precision drills. SAGAR (1997c) estimates that the mechanization program increased maize production by 1.2 million tons in 1996.
- The goal of the oilseed program is to reduce Mexico's chronic high dependency on imports of vegetable oils. The program supports the establishment of oil palm and coconut palm plantations in Mexico's Southwest. Support for oil palm includes annual per-hectare payments for nurseries and plantations. Support for coconut includes a one-time per-hectare payment for "mother" plantations and nurseries, and an annual per-hectare payment for plantations. The program plans to establish 30,000 hectares of oil palm in the states of Chiapas, Tabasco, Veracruz and Campeche, which could start producing up to 10,500 tons of oil annually within the next decade. Federal and state government spending by the end of 1996 amounted to 34 million pesos (US$4.5 million), 77 percent of the total cost of the program. The estimate for 1997 is 53 million pesos (US$6.7 million). This program will surely benefit domestic consumers of vegetable oil, but its effects on the feed industry are uncertain. Since the production of traditional oilseed crops is likely to be further reduced by the competition of coconut and oil palm, feed producers will likely be forced to import greater amounts of oilseed meal.
- The program to promote the use of improved maize (plus bean and rice) seeds is called "kilo por kilo" (a kilo for a kilo) because it consists on the sale of a kilo of improved seed to the producer, at the ongoing market price of a kilo of grain from the producer's own harvest. The program has been implemented in most of the country,

with the exception of highly technified areas in which the use of improved seed is already generalized. SAGAR estimates that 270 thousand hectares of maize and beans were planted during the 1996 crop year under this program, with 7 thousand tons of improved seed. Federal and state government expenditures on this program during 1996 reached 45.1 million pesos (US$5.9 million). Government expenditures increased to an estimated 153 million pesos (US$19 million) in 1997, to distribute 15,600 tons of improved seed that benefited 565,257 hectares. (SAGAR, 1996 and 1997). According to SAGAR's (1997c) estimates, the program increased maize production by 412 thousand tons in 1996.

The PROCAMPO Program†

PROCAMPO's direct payments to approximately 3 million producers covered roughly 14.1 million hectares in the 1997 crop year, at a total cost that year of 7.139 billion pesos (US$917 million). Four hundred and eighty-four pesos per hectare were paid for the 1996-97 Fall-Winter cycle and 556 pesos for the 1997-97 Spring-Summer cycle (SAGAR, 1996). Criteria for PROCAMPO's eligible surface have been made more flexible. Eligible surface in the original producer directory must be cultivated each cycle, or be dedicated to livestock production, or forestry, or an "environmental" program.

Producers can now use their future PROCAMPO payments as credit guarantees. They can also transfer their rights to PROCAMPO payments to input distributors, banks, credit unions, producer organizations, state governments, and government offices against the delivery of goods or services. Such transfers to acquire working capital and inputs has become increasingly popular among producers as an instrument to ease cash constraints. In the 1997 crop year, for example, 759 thousand producers, with 17 percent of the area under PROCAMPO, ceded their rights to future PROCAMPO payments in this manner (SAGAR, 1997a).

CONASUPO and ASERCA

CONASUPO, the long-lived Mexican marketing parastatal, remains the buyer of last resort of maize and beans at a "support" price. Up to 1994, CONASUPO was a major buyer of maize. For example, in the 1993 and 1994 crop years, CONASUPO bought 45 percent of the domestic harvest. The parastatal was consequently a major supplier to Diconsa, the milling, starch and feed industries, and even to livestock producers. Starting in August, 1995 cycle, the panterritorial price of maize paid by CONASUPO was substituted by a regional "support" price system, consisting of a "base" price, plus a fixed transport and handling adjustment, plus a regional "marketing" factor, plus a quality adjustment. Since the "support" price is now set at below market price levels in most regions, CONASUPO's participation in the market

†Editor's note: See Yunez-Naude, 1997 pgs 64-65 for an explanation of the PROCAMPO Program.

has dropped significantly. By the end of 1995, the agency's participation as a buyer of maize had dropped to 19 percent, and by the end of 1996 to roughly 8 percent (SAGAR, 1997c).

CONASUPO also operates a system of non-recourse loans whereby producers store the grain with CONASUPO against which CONASUPO advances 70 percent of the crop's value at the "support" price. The producer has at most three months to redeem his warehouse receipt, pay CONASUPO back and sell the product in the market, or leave the crop with CONASUPO and obtain the rest of the payment.

ASERCA, another government marketing support agency, operates a series of marketing support systems designed ad hoc for individual grains and oilseeds. For example, it gives direct payments to cotton producers to cover post-harvest fumigation costs. To promote domestic soybean production and the immediate marketing of the domestic harvest, ASERCA compensates wholesale soybean buyers for the difference between the price of imported soybeans and a higher "agreement" price that they pay to domestic producers. The agency operated a similar system of "agreement" prices for wheat from 1991 to 1995 (ASERCA,1997e). To reduce water consumption, ASERCA offers direct payments (additional to those of PROCAMPO) to producers that grow safflower instead of wheat or maize. And during the 1996-97 Fall-Winter cycle ASERCA compensated domestic buyers of sorghum produced in Tamaulipas, Nuevo León and Sinaloa, located in Jalisco or Nayarit, for the payment of high "agreement" prices to producers (Canacintra, 1997a).

Finally, ASERCA, jointly with the Ministries of Finance and Agriculture, operates a put-options program to reduce the price risk in the marketing of maize, wheat, sorghum, soybeans and cotton. The program effectively establishes a price floor for producers while maintaining their ability to sell at the market price when it is higher than the strike price established in the put-option contract. ASERCA pays part or the whole of the option premium, depending on the modality of the program chosen by the producer.

PROFITABILITY OF FEED GRAINS AND OILSEEDS

FIRA, a development bank that specializes in lending to commercial agricultural producers, undertakes periodic surveys of its clients to assess costs of production, producer prices and the profitability of basic grains and oilseeds. Because costs are calculated using a uniform methodology, FIRA's surveys can be used to monitor and compare the competitiveness of these crops grown under different water regimes—rainfed, reservoir irrigated and ground water-irrigated—across states, and across years. Although FIRA's surveys are not necessarily representative of the spectrum of commercial production systems in the country, they are the best systematic data set available for this purpose. A summary for the last two published surveys, for 1994-94 and the 1996-96 Spring-Summer cycles,[†] is presented below for the main feed grains (maize and sorghum) and oilseeds (soybeans and cottonseed).[9]

[†]Author's note: The 1994-94 Spring-Summer crop cycle refers to the months from May 1994 to October 1994. The Fall-Winter crop cycle refers to the months from November 1994 to April 1995, similarly for other years.

[9]Wheat is not included in the analysis because it is grown mainly in the Fall/Winter cycle and was therefore not part of FIRA's published surveys.

Maize. The profitability of maize, measured as the percent return on investment for commercial maize producers, ranged from -35 percent to 65 percent in 1994-94 and from -3 percent to 85 percent in 1996-96. From 1994-94 to 1996-96, the profitability of maize improved in most production systems and states (see Figures 6 to 8). Profitability improved in rainfed maize in Jalisco, Chiapas and Michoacán; it also improved in reservoir-irrigated operations in Sinaloa, Chihuahua and Durango, but worsened in Michoacán; and it improved in groundwater-irrigated operations in Chihuahua, Durango, Zacatecas and Guanajuato.

Figure 6: Profitability of Maize Production in Main Producing States of Mexico, Rainfed, 1994-94 and 1996-96

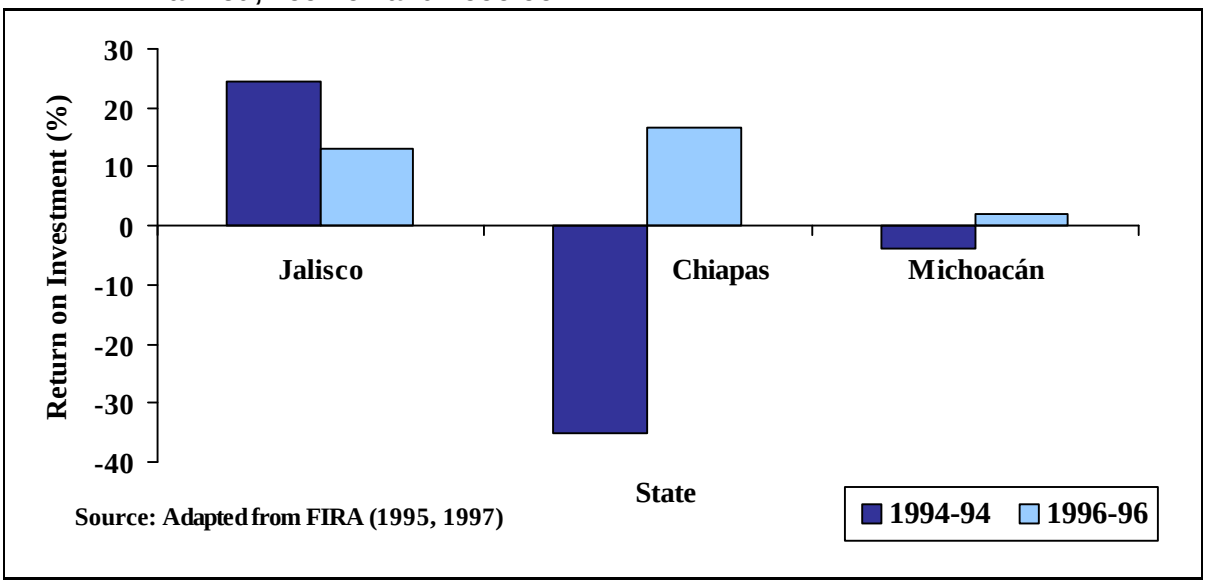


Figure 7: Profitability of Maize Production in Main Producing States of Mexico, Groundwater-Irrigated, 1994-94 and 1996-96

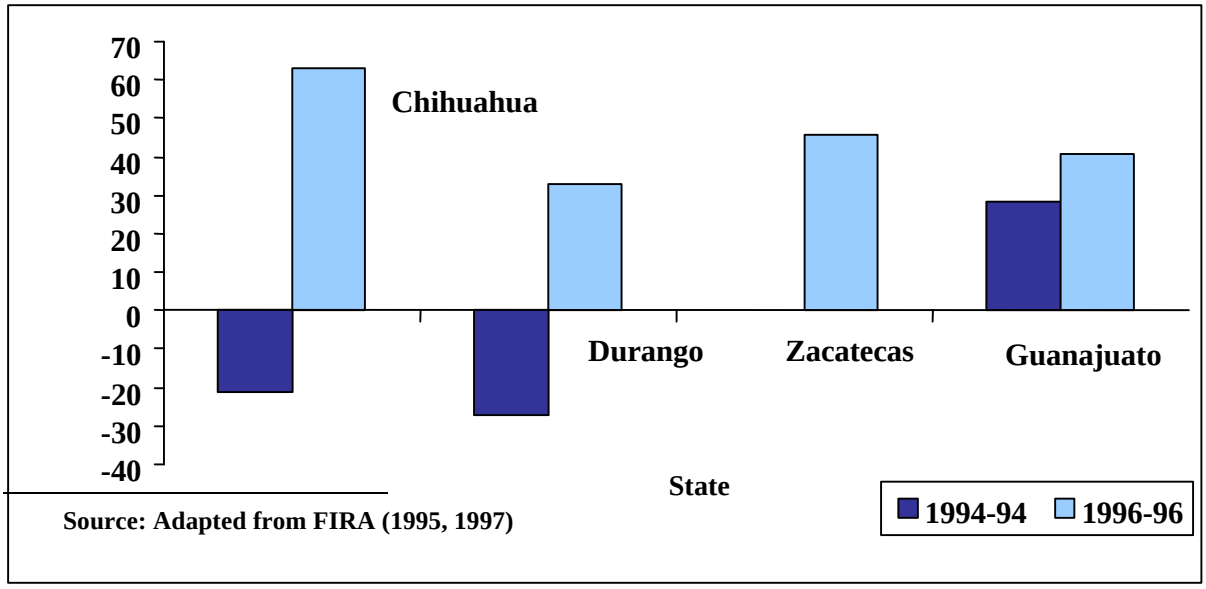
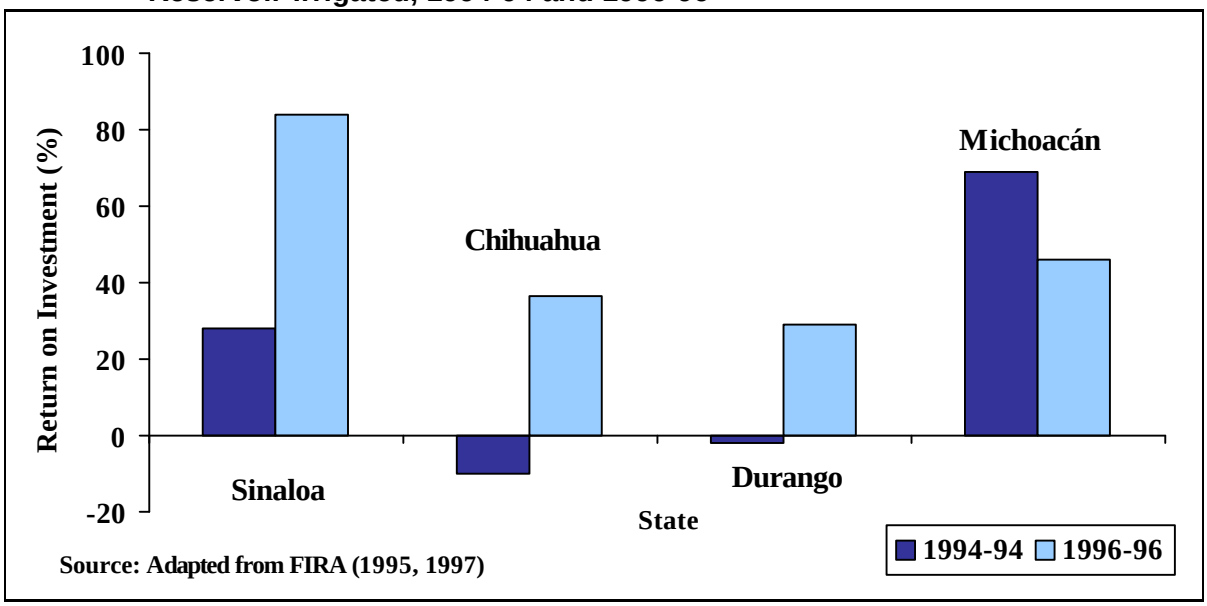


Figure 8: Profitability of Maize Production in Main Producing States of Mexico, Reservoir-Irrigated, 1994-94 and 1996-96



Farmgate maize prices and costs per ton presented a significant spatial variation during both cycles (see Figures 9 and 10). The economic conditions faced by the average commercial maize producer improved from one cycle to the other, as average real prices rose slightly by 2 percent and real average production costs dropped by 15 percent.

Figure 9: Spatial Distribution of Real (1994) Farmgate Maize Prices in Mexico, 1994-94 and 1996-96

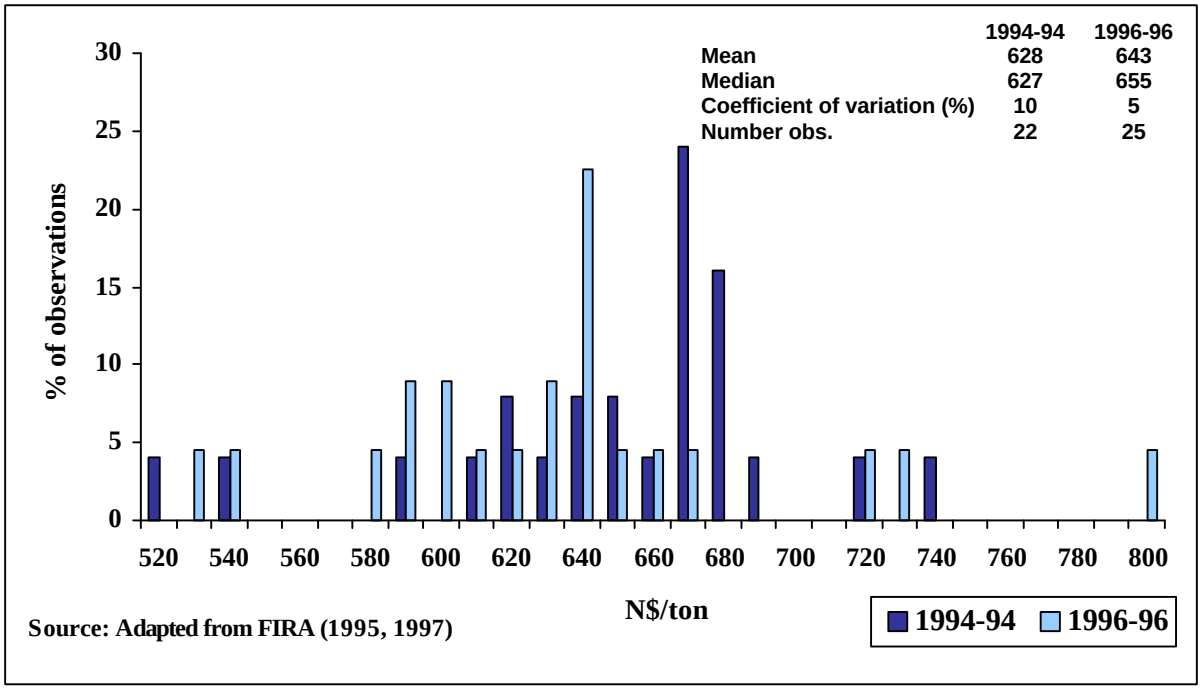
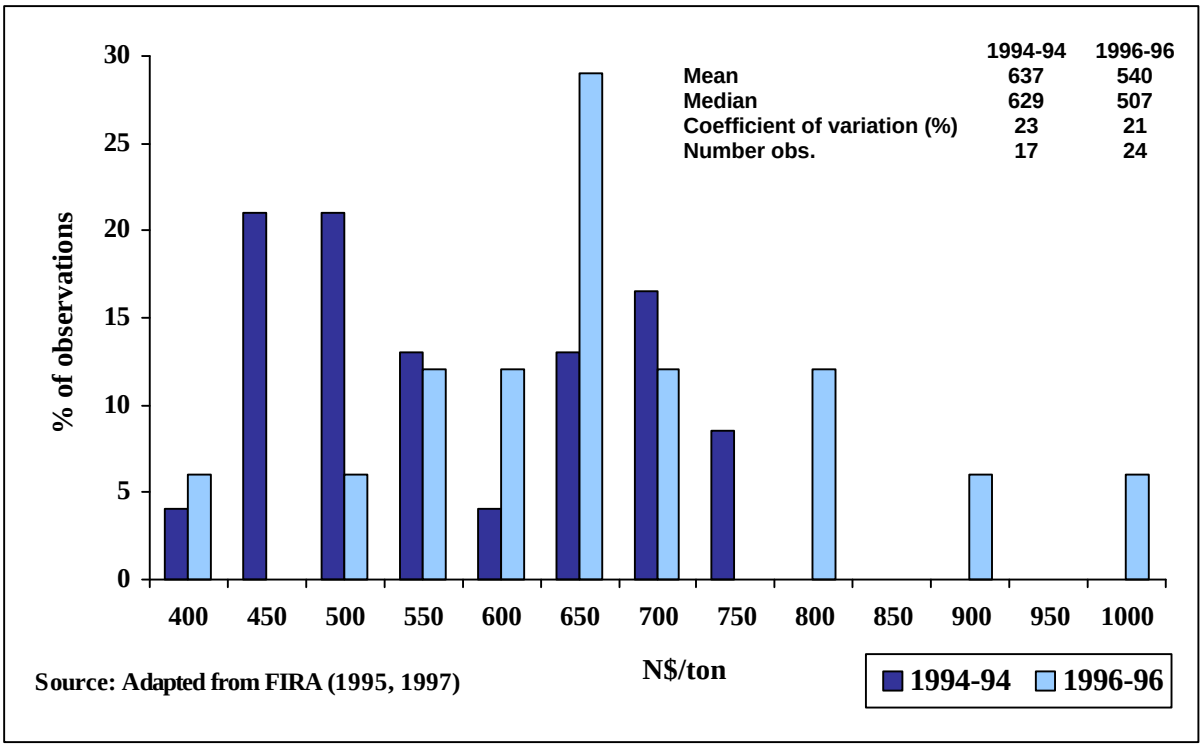


Figure 10: Spatial Distribution of Real (1994) Production Costs of Maize in Mexico, 1994-94 and 1996-96



Sorghum. Most of the sorghum is produced in Tamaulipas and the region in Mexico's central plateau known as the Bajío, mainly in Guanajuato, Jalisco and Michoacán. These four states cultivate roughly 80 percent of the area and produce 82 percent of domestic output. Two thirds of the sorghum area is cultivated under rainfed conditions.

The return on investment for commercial sorghum producers ranged from -20 to 45 percent in 1994-94 and from 2 percent to 95 percent in 1996-96. Profitability improved in most production systems and states surveyed in both years (see Figures 11 to 12). Profitability improved in reservoir-irrigated areas in Michoacán and Guanajuato, and in groundwater-irrigated operations in both of these states and in Chihuahua. However, while profitability in rainfed operations in Chiapas improved, rainfed production became unprofitable in Tamaulipas due to a drastic drop in yields as a result of the 1996 drought. Farmgate sorghum prices and costs per ton presented a significant spatial variation during both cycles (see Figures 13 and 14). The economic conditions faced by the average commercial sorghum producer improved as average real prices rose by 32 percent and real average production costs dropped by 5 percent.

Figure 11: Profitability of Sorghum Production in Main Producing States of Mexico, Groundwater-Irrigated, 1994-94 and 1996-96

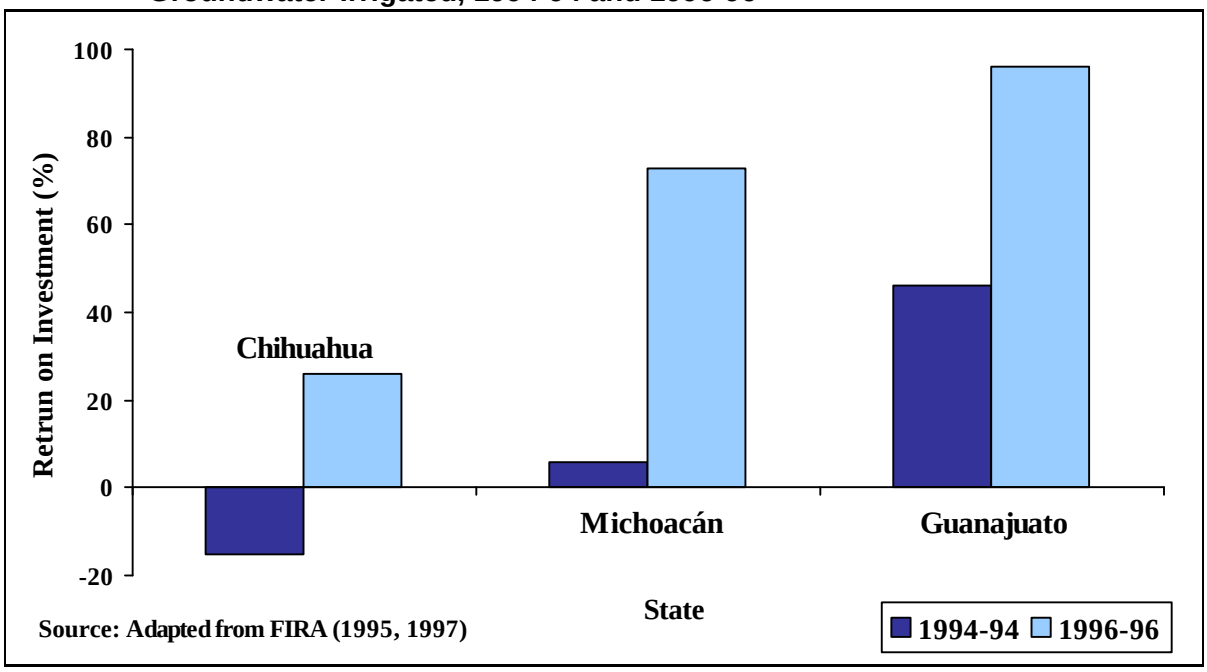


Figure 12: Profitability of Sorghum Production in Main Producing States of Mexico, Reservoir-Irrigated, 1994-94 and 1996-96

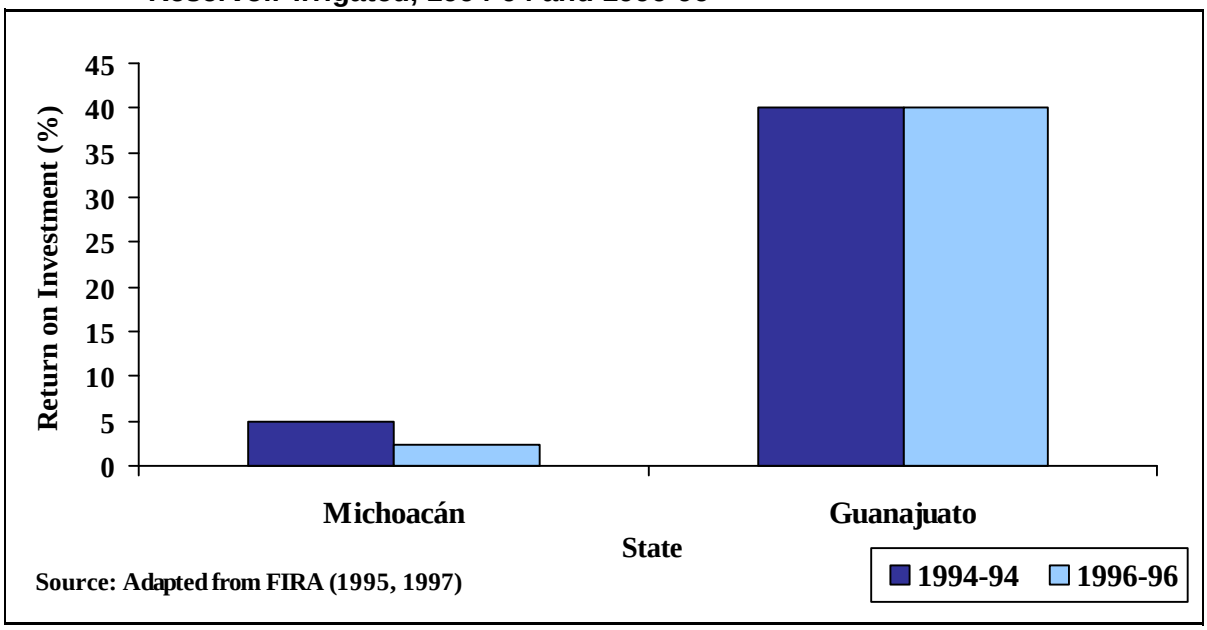


Figure 13: Spatial Distribution of Real (1994) Farmgate Sorghum Prices in Mexico, 1994-94 and 1996-96

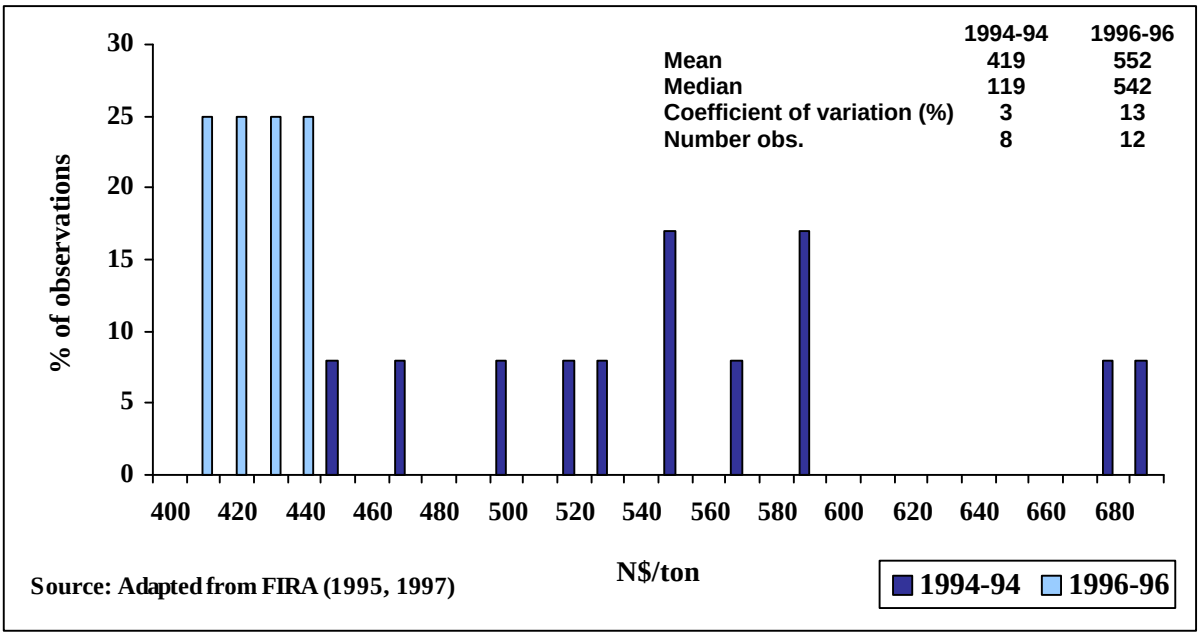
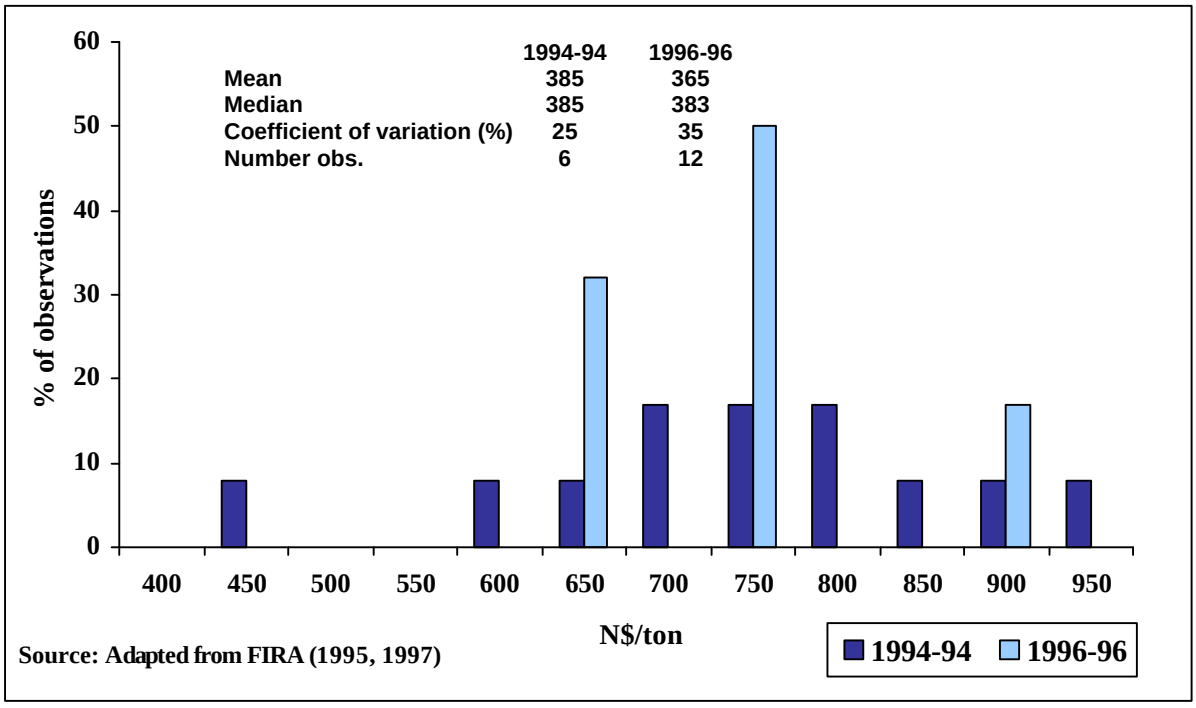


Figure 14: Spatial Distribution of Real (1994) Production Costs of Sorghum in Mexico, 1994-94 and 1996-96



According to FIRA (1993, 1995, 1997) the profitability of soybean production went from an average of 28 percent in 1991 to -24 percent in 1994. By 1996 few farmers in Sinaloa and Sonora were receiving credit for soybean production from FIRA or any other bank. Profitability dropped for the average farmer, in spite of the 20 percent drop in real, average, per ton costs of production (see Figure 15), because of the combined effect of lower yields and a 10 percent drop in real, average farmgate prices (see Figure 16).

Figure 15: Spatial Distribution of Real (1994) Farmgate Soybeans Prices in Mexico, 1994-94 and 1996-96

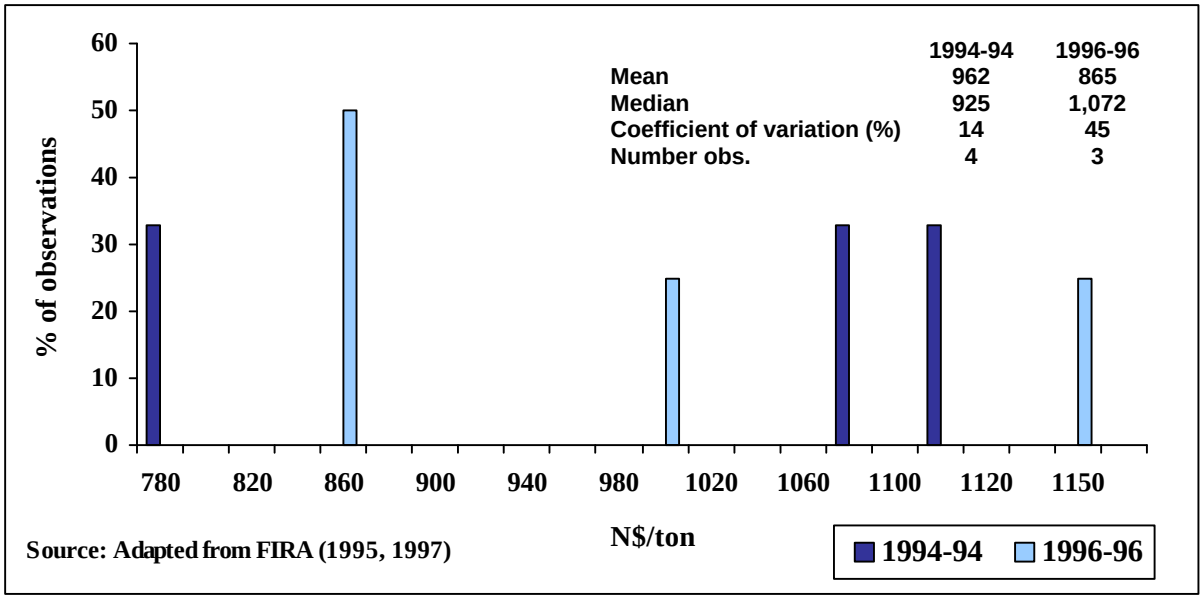
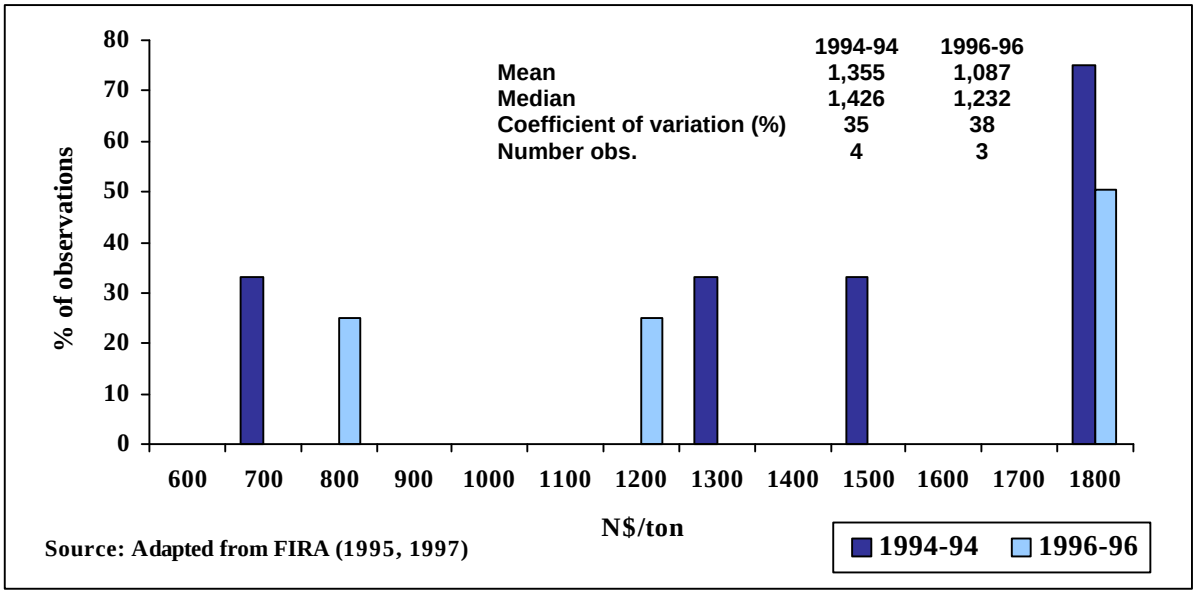


Figure 16: Spatial Distribution of Real (1994) Production Costs of Soybeans in Mexico, 1994-94 and 1996-96



Cotton. The return on investment for commercial cotton producers ranged from 6 percent to 45 percent in 1994-94 and averaged 20 percent 1996-96. The profitability of groundwater-irrigated cotton in Chihuahua improved. And although the profitability of cotton in Sonora, where it is mostly reservoir-irrigated, dropped between 1994-94 and 1996-96, it remained a highly profitable crop in this state (see Figure 17). Average, real production costs increased only 1 percent between the two periods, and average, real prices increased by 7 percent (see Figures 18 and 19).

Figure 17: Profitability of Cotton Production in Main Producing States of Mexico, Groundwater and Reservoir-Irrigated, 1994-94 and 1996-96

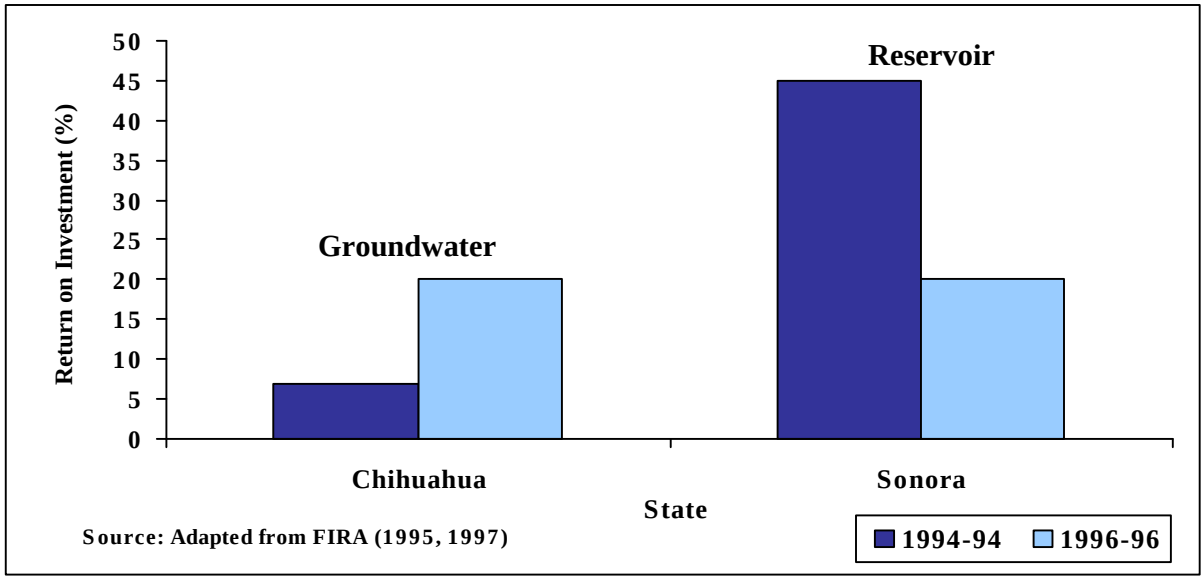


Figure 18: Spatial Distribution of Real (1994) Farmgate Seed Cotton Prices in Mexico, 1994-94 and 1996-96

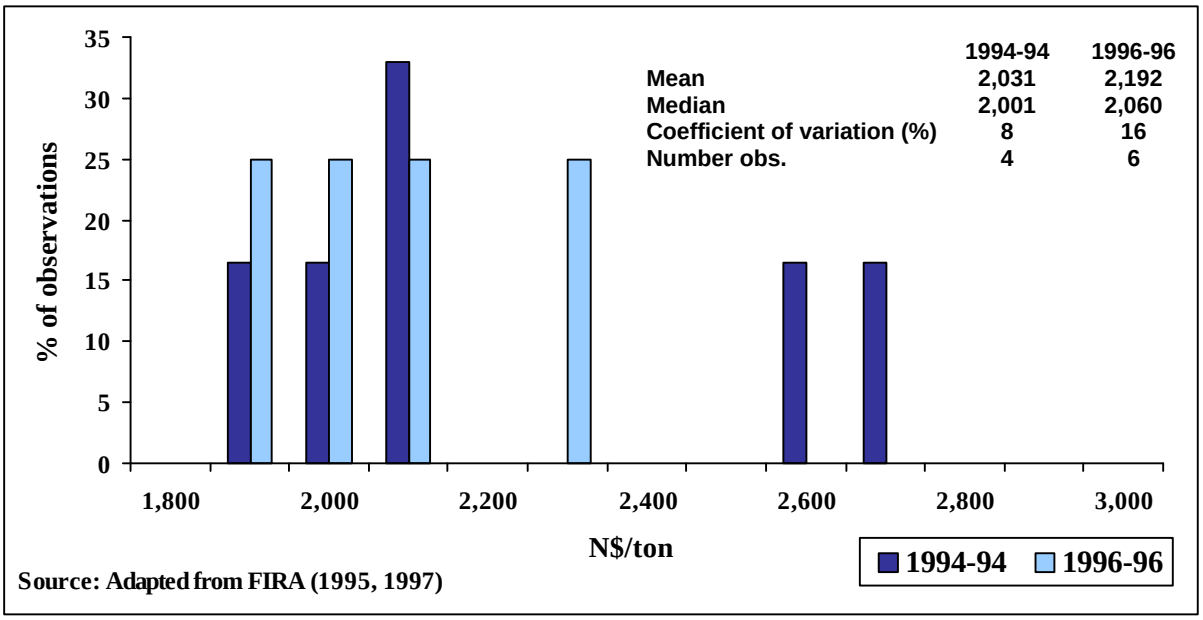
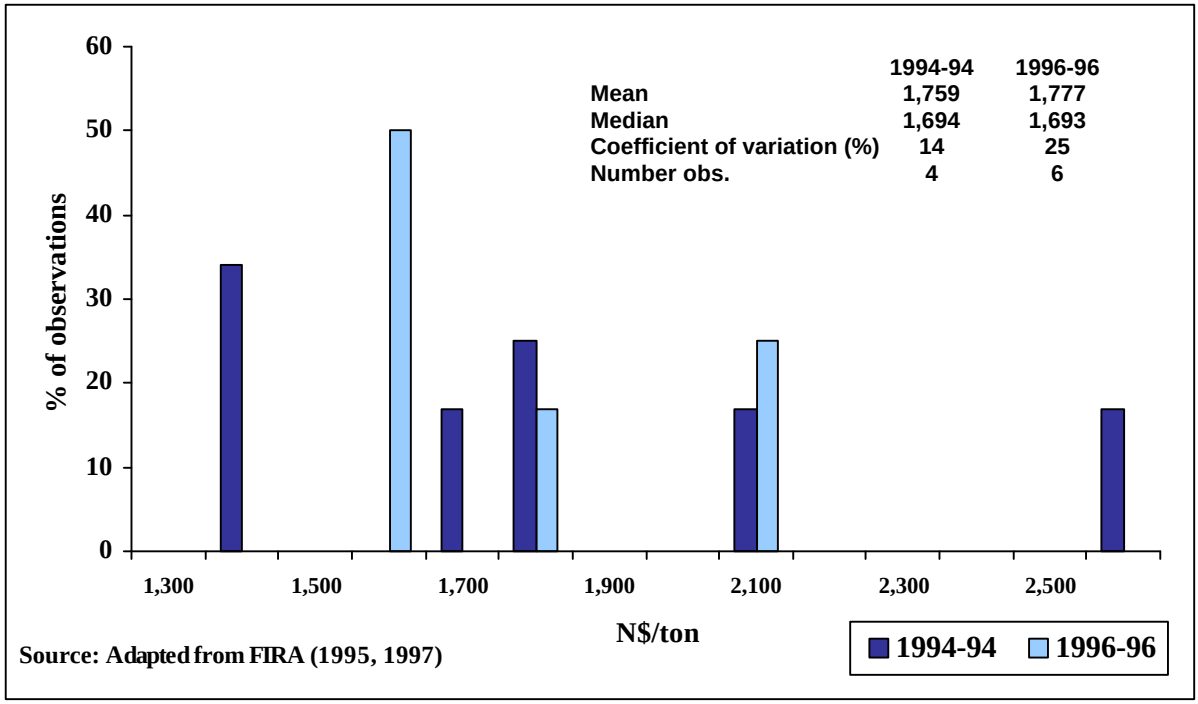


Figure 19: Spatial Distribution of Real (1994) Production Costs of Seed Cotton in Mexico, 1994-94 and 1996-96



SUMMARY AND CONCLUSIONS

In spite of the recent economic crisis, Mexico has sustained a rapid growth in the consumption of livestock products during the 1990s, due both to an expanding population and to continued shifts in eating habits towards such products. The domestic production of livestock products has been stimulated by this dynamic growth in demand, which in turn, has motivated a fast expansion of the domestic demand for feed.

Besides its fast growth, the Mexican feed industry has experienced a drastic restructuring in the past decade and a half, as a result of the new free-market environment in the country, brought about by trade liberalization, the thinning of government intervention, and the recent economic crisis. In contrast with the feed industry's structure a decade ago, vertically-integrated livestock operations today predominate over commercial feed plants. Judging by the high idleness of the installed capacity of commercial operations, this trend is likely to continue in the future.

Although the domestic feed industry has grown fast enough to satisfy the domestic demand for feed, the industry has become increasingly dependent on imports to meet its requirements of grains and oilseeds. Over the last two years, imports have supplied a fifth of the domestic apparent consumption of sorghum, 98 percent of that for soybean meal (imported as whole soybeans or as meal), over a third of that for cottonseed meal (imported as whole cottonseed or as meal), and over half of that for other oilseeds meals (imported as whole seeds or as meals). Results from regression analysis suggest that imports of broken maize, maize gluten,

sorghum, wheat, whole soybeans and cotton seed present the strongest links with volumes produced by the domestic feed industry. And recent NAFTA quota allocations for whole maize indicate that the share of its imports destined for feed use is growing fast.

Recent changes in policy, geared towards a greater role of markets and improved productivity, are affecting the supply and demand of grains and oilseeds. The greater fungibility of PROCAMPO's payments is easing cash constraints faced by producers. Within Alianza para el Campo, the mechanization and improved seed ("kilo por kilo") programs are likely to have positive effects on grain and oilseed production. But the program to increase domestic production of palm and coconut oils will most likely abate domestic prices of vegetable oils, and will therefore reduce producers' incentives to cultivate annual oilseed crops. The feed industry's dependence on imports of high-protein oilseed meals is therefore likely to continue. Meanwhile, the greater flexibility in grain and oilseed marketing supports now operated by CONASUPO and ASERCA, is having positive repercussions on producers' pockets.

Surveys of the major production systems for grains and oilseeds conducted by FIRA in recent years convey an optimistic panorama for domestic producers of grains and oilseeds, with the exception of soybeans. Although farmgate prices and production costs vary widely, depending on the region and the water regime, in most cases the profitability of these crops increased between 1994-94 and 1996-96, as real prices rose and per-ton production costs fell. The evolution of the profitability of these crops is, however, likely to remain highly differentiated geographically and technology-wise, even among commercial producers.

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STRUCTURAL DEVELOPMENTS IN THE MEXICAN LIVESTOCK SUBSECTOR: THE CASE OF FEEDER CATTLE AND BEEF PRODUCTION

Roberto Aceves Ávila and Enrique López López

INTRODUCTION

The purpose of this paper is to give an overview of the recent evolution of the Mexican Livestock Subsector, with special emphasis on feeder cattle, and to consider the internal and external factors that have been changing the scope and perspectives of producers. We also stress the interrelations between trade flows of grains and feeder cattle / meat from / to the United States and Canada. First, we briefly describe the general evolution of the Mexican Agricultural Sector, considering recent trends and changes that affect its development. In the next sections we analyze the characteristics of the supply and demand of live cattle / beef. Next, we analyze several foreign trade issues, including imports / exports from the North American Free Trade Agreement (NAFTA) region as well as the behavior of direct foreign investment in the sector, and identify the main problems affecting the development of this important subsector.

A BRIEF OVERVIEW OF THE MEXICAN AGRICULTURAL SECTOR

Since the signing of NAFTA, many people have argued about the asymmetric conditions of Mexican Agriculture compared to the U.S. and Canadian agriculture. This is something that we should bear in mind in order to understand the situation of our producers. Mexico is a country of about 1.95 million square kilometers, which is roughly half of the size of the United States. Almost 195.8 million hectares are dedicated to some agricultural and forestry activity. Eighteen percent of this surface is dedicated to crops, 41 percent to livestock raising and 41 percent to forestry. We have a total population of 93 million people, of which 40 percent lives in rural areas.

Agriculture is a major element of the Mexican economy. According to the 1990 census, about 22 percent of the total work force is working in rural areas (around 5 million people, without considering families). But agricultural Gross Domestic Product (GDP) represents around 7 percent of total Gross Domestic Product (GDP). These figures indicate an acute problem of income distribution of rural areas versus urban areas.

This income distribution problem is also present among different kinds of rural producers. For example, about 60 percent of all producers are growing crops on farms which are from less than 1 to 5 hectares, with yields below the national average. In the case of the livestock subsector, about 82 percent of the total raising facilities account for only 28 percent of the total herd, with an average of less than 50 head per ranch. This is an indicator that many of our producers are producing for personal-consumption or for very small local markets, with little responses to international market signals, coexisting with a highly dynamic market oriented exporting sector which is worth about 5 billion dollars a year.

The dynamic behavior of some areas in Mexican agriculture and agrifood industries is reflected in the agricultural trade balance. Trade in agriculture and agrifood sector represents more than 50 percent of total agricultural GDP. Even though Mexico is still a net grain importer (about 50 percent of the total agricultural import value comes from maize, sorghum, wheat, soybeans and other oilseeds), it is becoming an important importer of processed foods. With respect to exports, we are concentrating our activity on those commodities in which we have comparative and competitive advantage, like coffee, tomatoes, fresh fruits and vegetables as well as live cattle, with an approximate value of 3 billion dollars.

With respect to the institutional and legal environment of Mexican agriculture, in the last decade, the Mexican economy has undergone a tremendous process of adjustment and reform, in order to provide economic actors with a stable, long term, decision making framework. On one hand, changes in the legal framework, such as reform to the Agrarian Law, or Article 27th of our Constitution, or Laws referring to Norms and Quality Standards, or those related to auxiliary banking activities, just to mention a few, combined with the agreements concerning foreign trade, that is, regulations concerning NAFTA and World Trade Organization (WTO), have provided economic factors with a long term decision making framework. On the other hand, the economic environment has been affected by the privatization of banks, telecommunications, public warehouses, ports and other state-owned enterprises.

Of special interest are the reforms to the land tenure system in Mexico, comprised in article 27 of our Constitution. There are three basic forms of land tenure in Mexico: ejido[1], private, and public (or communal property). Ejido land represents 31.7 percent of total land ownership (about 34.3 million hectares). Private land represents 65.1 percent of the total (about 70.5 million hectares). The remaining 3.2 percent is public and communal land (about 3.5 million hectares).

[1] Ejido is a communal ownership system.

In 1992, Article 27 of the Constitution and the Agrarian law was reformed (see Table 1). This reform allows increased private land ownership and a greater degree of certainty in property. The reform makes it possible for ejido farmers (those jointly owning common lands) under certain conditions to own, sell, rent or mortgage their land. It eliminates the legal prohibition against the formation of productive associations with other producers or businesses, while limiting foreign investors to minority participation in ejido capital. To avoid excessive concentration of land ownership and the emergence of large illegal land extensions, limits on maximum property size have been established together with regulations.

In fact, the Mexican producers have been exposed to a very rapid process of opening the economy. For example, in 1986 we entered the General Agreement on Tariffs and Trade (GATT) and unilaterally began our tariff reduction and tariffication policies. In 1992 we signed our first free trade agreement with Chile. In 1994 we signed the NAFTA; in 1995 we had free trade agreements with Bolivia, Colombia, Venezuela and Costa Rica; and a few months ago we closed the negotiations for a free trade agreement with Nicaragua. Right now we are in the middle of negotiations with MERCOSUR and the European Union, and we are continuing the free trade negotiations with Panama, Ecuador, Peru, the Triangle of the North, and of course, we are strong supporters of the Free Trade Agreement of the Americas (FTAA) initiative.

Table 1: Main Changes in Agrarian Law, February 26, 1992

Main Items	***Changes in Legislation***			
Land Distribution	Declares an end to the land redistribution program and defines property rights for owners.			
Stock Companies	Private corporations may own or rent rural land.			
Foreign Ownership	Up to 49% of series T shares			
Land Limits	Up to 25 times the limits of the small property			
Land Limits	***Per Individual***		***Per Corporation***	
Concept	***Hectares***	***Acres***	***Hectares***	***Acres***
Irrigated land	100	247.1	2,500	6,175.0
Cotton production	150	370.5	3,750	9,262.5
Other Agric. Prod.	300	741.0	7,500	18,525.0
Forestry	800	1,976.0	20,000	49,400.0

Source: SAGAR. 1 ha. (hectares) is equivalent to 2.47 acres

Trade policy is by far one of the main instruments that is changing the shape of the agricultural sector as we know it. In particular, NAFTA is an important driving force towards market orientation. For example, between 1990 and 1996 total trade between Mexico and the United States has increased almost 135 percent, and total trade with Canada has increased almost 290 percent in the same period. If we compare these figures with, for example those for the European Union or Japan, we will see that our trade with them has increased 35 percent and 83 percent respectively during the same years. Agricultural trade between Mexico and the United States, has grown about 60 percent during the same period.

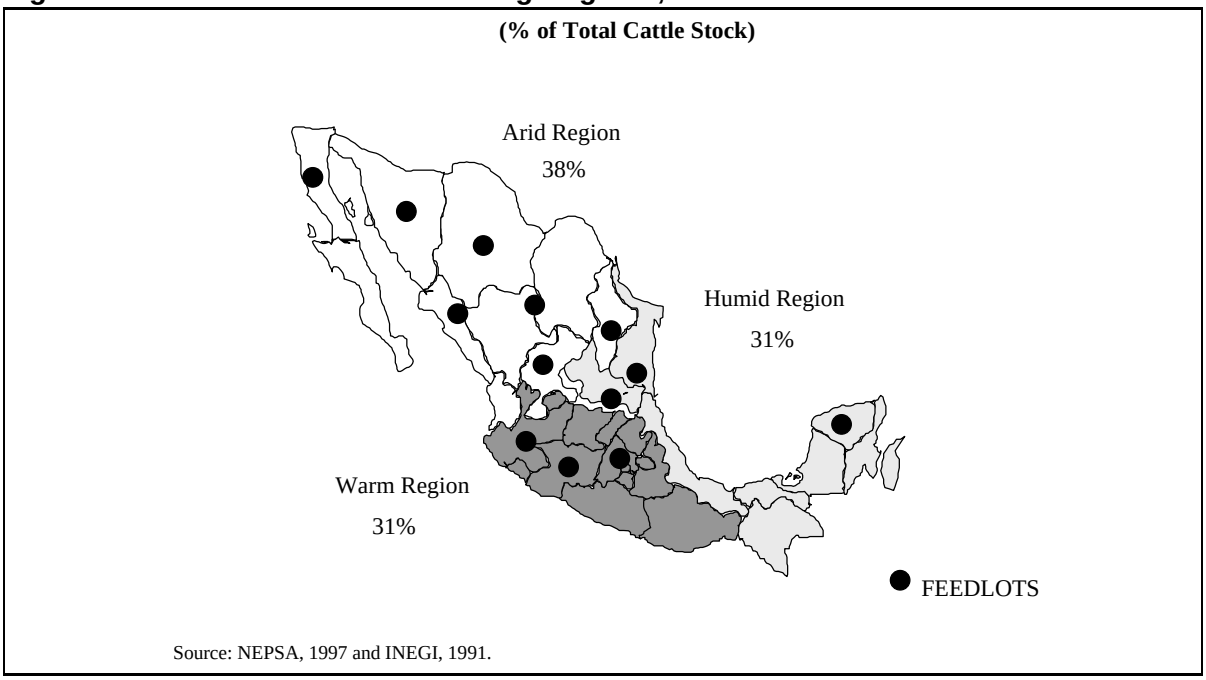
The rapid expansion of our agricultural trade is changing the vision of producers and agrifood processors. Free trade and globalization imply the substitution of tariffs with norms, standards and new regulations that impact efficiency, quality and price of our agricultural goods. Mexican producers and agribusiness all around the country are creating new alliances that tend to integrate production, processing, marketing and distribution of agricultural goods, in order to successfully confront the new market requirements. Good examples of this new trend are the poultry, avocado and tomato industries.

THE MEXICAN LIVESTOCK SECTOR: THE SUPPLY SIDE

According to the 1991 Agricultural Census, about 38 percent of the cattle herd are in the North and Northwest states of Mexico, on arid lands. This is the same region in which most of the feedlots are concentrated, too. Nevertheless, with the comparative advantages of grazing, 62 percent of the herd is concentrated in the humid and warm regions of the country; 59.6 percent of all cattle is raised on rangeland; 16.5 percent in feedlots and the rest, 23.9 percent, in a combination of both (see Figure 1).

The main cattle and beef producers in our country are the states of Jalisco and Michoacán in the warm region, Veracruz, Chiapas, Tabasco and Tamaulipas in the humid region, and Chihuahua, Sonora, and Durango in the arid region. All these states account for about 60 percent of total production (see Table 2).

Figure 1: Mexico—Main Cattle Raising Regions, 1991



Source: NEPSA, 1997 and INEGI, 1991.

In terms of cost of production, currently feedlots are less profitable vis-à-vis pasture because of the cost of grains and the competitive advantages of the American feedlots in the border zones. Nevertheless, in the long run feedlots are more profitable because of their higher capital recycling, thanks to the possibility of obtaining more animals in less time. According to the National Feeders Association, by the beginning of 1997 the installed capacity of feedlots in Mexico was 1.2 million animals per month, but only 39 percent was in use (about 465 thousand animals). Some feedlots in Jalisco and in the north of Veracruz, Tabasco and Chiapas are using a combination of both systems, with outcomes very similar to American standards, using a combination of 30 months in prairies and two to six months in feedlots. Access to imported grains and other inputs at world market prices is one of the crucial issues for the competitiveness of feedlots.

According to INEGI, 1995 (see reference section), about 54.8 percent of total beef production comes from small private properties, 40.8 percent in ejidos, and 4.4 percent in other kinds of land tenures. As we said before, about 82 percent of the total raising facilities account for 28 percent of stock, with an average of less than 50 head per ranch. Sixteen percent of the production units have between 50 and 500 head.

In the last five years, the Mexican Livestock Subsector has been facing changes that affect its development. On one hand, severe droughts in the northern states of Mexico have caused the cattle herd to decrease since 1994. From a maximum of 31.6 million head in 1994, there were 29.3 million head left in 1996, which represents a 7.1 percent decrease in three years, with effects varying from region to region (see Table 2).

Table 2: Mexican Beef Cattle Herd, 1993-1996

STATE	*1993*	*1994*	*1995*	*1996*	*% CHANGE 1993-96*
			Thousand Head		
ARID REGION					
Baja California	118.1	123.4	159.3	165.7	40.3
Baja California Sur	125.2	131.2	133.7	131.2	4.8
Coahuila	559.2	576.8	568.1	404.9	-27.6
Chihuahua	1,892.1	1,990.9	1,783.1	917.9	-51.5
Durango	1,175.1	1,165.4	1,171.8	1,143.3	-2.7
Nayarit	630.1	582.6	573.1	573.9	-8.9
Nuevo León	561.0	555.4	555.5	459.9	-18.0
Sinaloa	1,583.0	1,613.1	1,627.6	1,586.3	0.2
Sonora	1,627.6	1,682.0	1,683.5	1,666.4	2.4
Zacatecas	1,072.4	1,068.5	1,074.9	1,058.3	-1.3
SUBTOTAL	9,343.8	9,489.3	9,330.6	8,107.8	-13.2
WARM REGION					
Aguascalientes	84.7	82.0	81.5	61.5	-27.4
Colima	221.6	231.1	240.9	251.2	13.4
Distrito Federal	5.2	6.2	5.1	5.2	0.0
Guanajuato	650.2	635.6	629.0	610.1	-6.2
Guerrero	1,177.5	1,182.0	1,185.5	1,189.1	1.0
Hidalgo	381.6	397.3	401.3	385.8	1.1
Jalisco	2,404.5	2,555.7	2,593.6	2,577.9	7.2
México	410.1	426.9	434.2	338.8	-17.4
Michoacán	1,480.0	1,551.2	1,541.5	1,542.5	4.2
Morelos	99.3	100.3	98.6	92.7	-6.6
Oaxaca	1,548.2	1,493.4	1,506.8	1,515.9	-2.1
Puebla	455.5	463.2	471.1	478.1	5.0
Querétaro	166.4	166.4	169.7	166.4	0.0
Tlaxcala	18.0	18.5	21.6	27.6	53.3
SUBTOTAL	9,102.7	9,309.8	9,380.4	9,242.8	1.5
HUMID REGION					
Campeche	475.9	523.4	546.7	594.1	24.8
Chiapas	2,933.3	2,933.3	2,911.3	2,864.1	-2.4
Quintana Roo	105.0	113.5	90.7	90.7	-13.6
San Luis Potosí	767.4	770.4	753.0	637.2	-17.0
Tabasco	1,720.8	1,719.5	1,782.8	1,735.7	0.9
Tamaulipas	1,076.2	1,107.4	1,122.2	919.0	-14.6
Veracruz	4,766.0	4,715.0	4,762.2	4,432.1	-7.0
Yucatán	844.6	871.4	857.5	677.9	-19.7
SUBTOTAL	12,689.2	12,753.9	12,826.4		
TOTAL	**31,135.7**	**31,553.0**	**31,537.4**	**29,301.4**	**-5.9**

Source: Centro de Estadística Agropecuaria, SAGAR.

On the other hand, changes in the marketing environment of meat, caused by the opening of the economy and the change in the productive structure of the meats markets have changed the perspectives and the short run incentives of producers. Imports of boneless meats, sometimes under conditions that may suggest unfair trade practices, tend to displace the marketing of Mexican beef in some domestic

markets. This is combined with the fact that the production of beef has been increasing in 1994 and 1995, as a result of the slaughtering of a significant part of the cattle herd.

Beef production in Mexico increased 26.8 percent between 1990 and 1995. Especially, in 1994 and 1995 beef production grew 8.6 percent and 3.5 percent respectively In 1996, beef production fell in almost 6.0 percent (see Table 3).

Table 3: Beef Production in Mexico, 1990-1997

Year /Product	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
				Tons				
Beef (Tons)	1,113,919	1,188,687	1,247,195	1,256,478	1,364,711	1,412,336	1,329,947	1,340,071
% Change	-------	6.7%	4.9%	0.7%	8.6%	3.5%	-5.8%	0.8%

Source: SAGAR, Centro de Estadística Agropecuaria.

As mentioned above, the growth in beef production observed in 1994–95 combined with an increase in total cattle exports resulted in a sharp decline in the cattle herd. Nevertheless, the share of beef in the total meat production has decreased, from 51 percent in 1970, to 35.4 percent in 1997 (see Table 4). This situation reflects the substitution of beef for cheaper animal protein, mainly because of the change in relative prices of these products.

Table 4: Shares of Meat Production in Mexico, 1970 and 1997

SPECIES	*1970*	*1997*
	%	%
Beef	51.0	35.4
Pork	28.0	24.8
Poultry	17.0	38.1
Goat & Sheep	4.0	1.7

Source: SAGAR, Centro de Estadística Agropecuaria.

The livestock producer has been long exposed to market competition, with a very low producer subsidy equivalent (PSE) level, and low compared to the ones observed for most years in the United States and Canada according to the Organisation for Economic Co-operation and Development (OECD). Even though the methodology for calculating PSEs for beef is questionable, it is obvious that our livestock, and specially beef, industries have not been protected (see Table 5).

Table 5: Producer Subsidy Equivalents for Beef and Veal (Percentage)

	1989-1991	*1993-1995*	*1994*	*1995p*	*1996e*
Mexico	10	3	14	-23	-1
U.S.A.	7	6	4	5	5
Canada	20	16	14	14	13

Source: OECD, 1997.

In fact, the protection for the beef and veal industries have been substantially less than the protection given to other segments of the livestock subsector (see Table 6).

Table 6: Producer Subsidy Equivalents for Livestock Products (Percentage)

	1989-1991	*1993-1995*	*1994*	*1995p*	*1996e*
Mexico	21	16	29	-10	8
U.S.A.	24	17	18	14	16
Canada	40	33	33	30	29

Source: OECD, 1997.

In 1995 and 1996 the Secretariat of Agriculture began to reverse this negative support trend, and implemented the Alianza para el Campo (Alliance for Agriculture) program. Alianza is a set of strategies aimed to increase the competitiveness of agricultural producers all around the country, including the livestock producers.

Alianza para el Campo is the first step toward the goal of improving welfare of the rural sector. This support scheme is based on the concept that it is the producer, and not the government, who has to take the decision of where to allocate budget resources in rural areas. Therefore, the Alianza budget is allocated in all states depending on the demands, targets and strategies that are designed at the state level, with the participation of producers and local authorities. The Federal Government fixes general criteria, evaluates and supervises the use and impact of resources, but the specific resource allocation in all projects is a decision taken at the sub-national level. This is a process that we call federalization. Budget allocation also depends on the willingness of state governments and producers to participate with their own resources in the selected programs. For every peso that the State Government and the producer provide, the Federal Government will provide another peso, generating a tripartite system of shared responsibility.

Within Alianza we have programs associated with the production of specific commodities (maize and dry beans seed exchange, milk, coffee, oilseeds and rubber), while others are of a more general nature (animal and plant health, genetic improvement, rural training and extension, women in rural development, marketing promotion). Specifically, in the case of livestock we have the following programs:

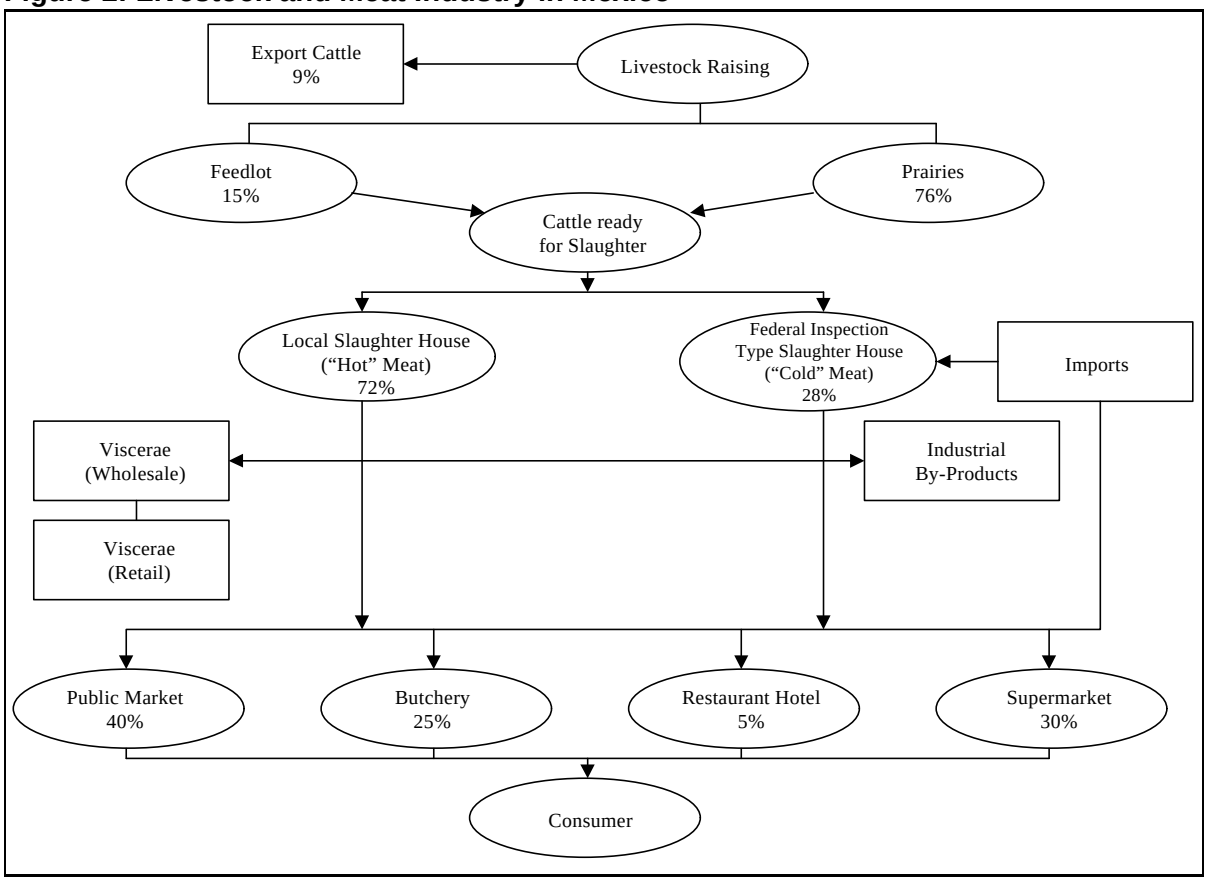
- ***Better Livestock*:** aimed at increasing the production of meat and milk per animal unit, through the acquisition of national, high genetic quality breeding animals. It also aims to increase the cattle herd by supporting the acquisition of national heifers.
- ***Repopulation of Cattle Stocks*:** aimed at promoting the recovery of cattle raising by importing heifers, breeding animals, semen and cryogenic thermic units. Support varies between 15 percent and 25 percent of the cost of heifers and breeding animals; and 50 percent in the acquisition of semen and cryogenic thermic units.

- ***Prairies*:** aimed at rehabilitating already existing prairie lands, creating new ones, increasing the technological level of livestock production units and limiting the expansion of rangeland into environmentally sensitive areas. The program supports 50 percent of all purchases of seeds, fences and basic infrastructure material, with a maximum payment of about $10,000 US dollars per farm.
- ***Infrastructure for fences:*** aimed at improving the management practices for forage and feed. Government support is about 50 percent of total investment.

Market Structure

We see from Figure 2 that there is little integration along the livestock marketing chain. The fragmentation of producers and its small scale operation favors this situation. On average, about 76 percent of Mexican cattle are fed grass, and the rest grain.

Figure 2: Livestock and Meat Industry in Mexico



Source: NEP, Comercialización de la Carne de Bovino en México. July 1997.

In Mexico the production of beef usually involves several stages and actors. Private traders (acopiadores) buy cattle from producers and resell them to the feedlots (engordadores). After a period that varies between 6 months (grain fed) to

2 years (grass-fed) fattening, the steers are sold to intermediaries or middlemen (introductores) who resell them to slaughterhouses. Vertical integration between producers and slaughterhouses is a process that is just emerging, and is complicated by the extreme dispersion of producers. Vertical integration is more common in the case of pork production, where almost 30 percent of pigmeat production is vertically integrated and another 30 percent of production comes from producer's associations.[2]

In the case of slaughterhouses, all of them are subject to health inspections through the Secretariat of Health. Slaughterhouses that meet federally approved standards for inspection (or Federal Inspection Type Plants; TIF) have high sanitary standards and advanced technological processing levels. SAGAR (the Secretariat of Agriculture), Livestock and Rural Development Branch is in charge of inspecting and certifying the general conditions of the TIFs. SAGAR has accredited about 199 TIF slaughter plants, but these account for less than 10 percent of all slaughterhouses in Mexico, and 28 percent of total slaughter in the country.

About 25 percent of all 199 TIF plants are dedicated to beef, and the rest are dedicated to poultry and pork. In 1991 the Government began with the privatization process of TIF plants, and almost 40 percent of these plants are currently owned and operated by regional livestock producers' associations and feeders. The rest are in hands of other private producers that are not integrated with livestock raisers or feeders.

In the case of municipal, or local privately owned and operated slaughterhouses, its technical and sanitary conditions tend to be poor. Under the 1994 Law on Animal Health, all slaughter and meat processing plants built in Mexico are now required to be TIF plants.

We must mention the case of Ferreria, the biggest slaughterhouse in the country, that along with IDA, a state-owned enterprise, used to control the supply of carcasses to Mexico City. In 1989, about 80 percent of Mexico City carcasses were supplied by IDA. Until 1992, IDA imported live cattle and controlled beef and veal supply to Mexico City through Ferrería, and IDA passed on to middlemen (introductores) the price it received from sales. In 1993 IDA was privatized and livestock producers were subsequently provided with investment capital by the Government to build new slaughterhouses. Today, IDA is in the hands of the National Confederation of Livestock Producers (Confederación Nacional Ganadera, CNG). Since 1991 Ferreria stopped its slaughterhouse activities but continued as one of the biggest meat marketing facilities in Mexico.

One of the main reasons producers do not want to use TIF plants is the cost of slaughter, about 30-40 percent higher than the one of municipal slaughterhouses. According to Foreign Investment Review Agency (FIRA) and NEPSA, only around 40 percent of the total capacity of TIF plants is in use. Most of the meat is directly

[2] See OECD (1997b).

distributed as "hot" meat to small butcheries and public markets. About 25 percent goes to supermarkets. Modernization of the slaughtering and marketing of meat has been one of the main concerns of the Mexican Government.

MEXICAN LIVESTOCK SECTOR: THE DEMAND SIDE

Beef and other meat products are highly elastic in terms of price and income. In fact, price is the most important factor that influences the shopping decisions of Mexican housewives. For each 1 percent increase in income, or a 1 percent decrease in price, meat and dairy products demand increase their purchase by 1 percent and 2.4 percent respectively (see Table 7).

Beef is perhaps the most affected product by changes in price, and this may help explain why the consumer has been switching from beef to other animal protein sources. The retail prices of beef in relation to pork, poultry and egg has been increasing in the last year (1997), which explains the switching to other products.

Table 7: Income and Price Elasticities of Demand for Processed Foods in Mexico

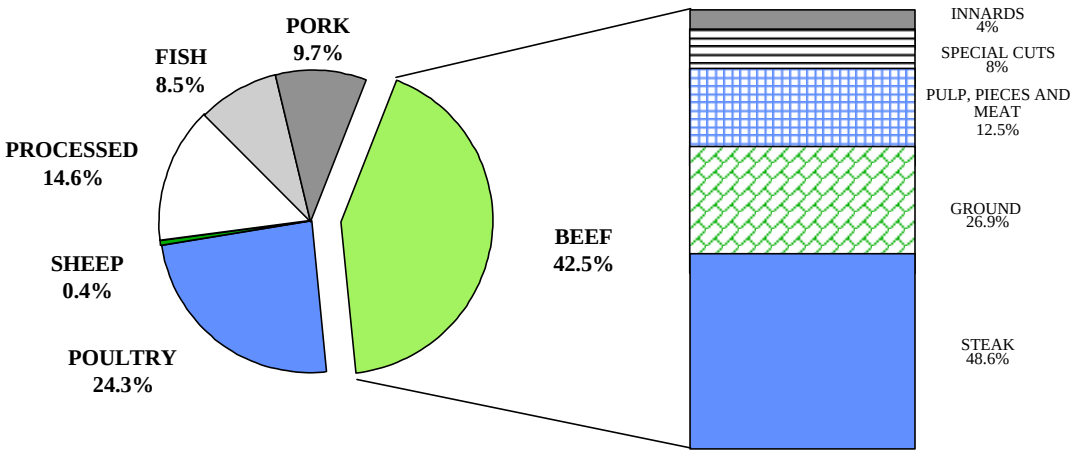
	INCOME ELASTICITY	***PRICE ELASTICITY***
Meat and Dairy Products	0.99962	-2.350
Canned Fruits and Vegetables	1.00000	-0.998
Wheat Flour Products	0.99966	-0.996
Corn Flour Products	0.99913	-0.713
Oils and Fats	0.99977	-0.999
Other Food Products	1.00046	-0.992
Alcoholic Beverages	1.00000	-0.989
Beer	1.00022	-0.998
Refreshments and Sodas	1.00022	-1.004
Tobacco and its Products	1.00065	-0.994

Source: BANAMEX, 1992.

According to the National Survey of Income-Expenditure 1994, in Mexico family expenditure dedicated to beef is the highest of all animal protein sources (42.5 percent). More than 60 percent of Mexican families eat beef two days a week as an average, but its consumption is more frequent in higher income strata[3] (see Figure 3).

[3] See ENURBAL (1995).

Figure 3: Mexico—Expenditure in Animal Protein, 1994



Source: INEGI.

Mexican consumers prefer steak, 22 percent in American type cuts, and 78 percent in Spanish type (very lean) cuts. The preference for Spanish cuts is very common in the central and southern states of the country, while the American cuts are preferred in the northern states of Mexico.

Per capita beef consumption has been increasing in the last decades, from 9.1 kilograms / year in 1970 to 11.4 kilograms / year in 1996 (25.3 percent). About 85 to 90 percent of total per capita consumption comes from domestic sources and the rest is imported, mainly from the United States (see Table 8).

Table 8: Mexico—Apparent Consumption of Beef (Tons)

	1970	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*
					Tons					
Slaughter	**436,622**	**666,182**	**677,268**	**667,567**	**721,071**	**753,200**	**837,681**	**848,943**	**966,810**	**925,199**
Municipal	327,496	581,953	560,450	584,214	621393	603,408	626,323	627,926	670,319	662,203
TIF	109,126	84,229	116,818	83,353	99,678	149,792	211,358	221,017	296,491	262,996
Imports	**----**	**54,701**	**64,293**	**142,473**	**205,694**	**228,559**	**152,921**	**192,600**	**60,238**	**138,604**
Apparent Consumption	**436,622**	**720,883**	**741,552**	**810,040**	**926,765**	**981,759**	**990,602**	**1,041,543**	**1,027,048**	**1,063,803**
Population (000s)	**48,225**	**77,462**	**79,280**	**81,141**	**83,045**	**84,994**	**86,989**	**89,031**	**91,120**	**93,258**
Per Capita Consumption (kg)	**9.1**	**9.3**	**9.4**	**10.0**	**11.2**	**11.6**	**11.4**	**11.7**	**11.3**	**11.4**
Domestic production	9.1	8.6	8.5	8.2	8.7	8.9	9.6	9.5	10.6	9.9
Imports	0.0	0.7	0.8	1.8	2.5	2.7	1.8	2.2	0.7	1.5

Source: NEPSA

Mexican urban consumers prefer “hot”, non frozen meat, as a synonym of freshness. The problem is that most of this meat comes from slaughterhouses with no or little sanitary control. In fact, this kind of facility is prohibited by law, but the authorities have not been able to close and substitute municipal slaughterhouses for TIF plants.

Even though most of the meat imports affect and compete in supermarkets and restaurants, they have become an important price reference for other segments. Most of the meat imports coming from the United States consist of frozen, boneless meats from where the Spanish cut can be obtained. The Mexican market has become a price taker, following American reference prices for imports. This situation creates a problem for the Mexican market, since most of our meat imports consist of non classified remainders of the American market (offal, low quality cuts and other pieces not usually consumed by the American consumer). This allows imports to be sold at low prices in the Mexican market competing with Mexican meat under unequal conditions. In fact, the internal price adjustment depends not on domestic inflation, but rather on the price of imports and the exchange rate. This is why in 1994-95, the National Livestock Producers´ Federation (CNG) initiated a dumping case against Mexican imports of meat from the United States (see Table 9).

In April 1996, the National Livestock Producers´ Federation (CNG) agreed to drop the antidumping case against beef imports from the United States. It was agreed that CNG and the U.S. National Cattlemen´s Association would exchange information and develop a program to promote the repopulation of the cattle herds in Mexico.

INTERNATIONAL TRADE ISSUES

In 1994, with the signing of NAFTA, trade of cattle and beef and veal was liberalized with both the United States and Canada. Under the Uruguay Round Agreement (URA), imports of live cattle, beef and veal are subject to a 50 percent tariff. Nevertheless, since 1994 rates of 15 percent for live cattle, 20 percent for fresh beef and 25 percent for frozen beef, have been applying on a Most Favored Nation Basis. For offal, the NAFTA import tariff of 20 percent will be removed by year 2003, and the 25 percent base import tariff for frozen beef set under the URA will be reduced by 10 percent by 2004, but the rate of 20 percent for fresh beef will continue to apply on a Most Favored Nation basis.

Table 9: Tariff Phase-Out Schemes for Cattle and Beef under NAFTA

	Description	*Base*	*Tariff Phase Out* *USA*	*Canada*
Live Animals				
0102.10.01	Pure Race Breeders	Exempt	D	D
0102.90.02	With pedigree	Exempt	D	D
0102.90.03	Bovines for slaughter, when imported by IDA	Exempt	D	D
0102.90.99	The rest	Exempt	D	D
Fresh or Frozen Meat				
0201.10.01	Carcass or half carcass	Exempt	D	D
0201.20.99	Cuts with bone	Exempt	D	D
0201.30.01	Boneless	Exempt	D	D
Frozen Meat				
0202.10.01	Carcass or half carcass	Exempt	D	D
0202.20.99	Cuts with bone	Exempt	D	D
0202.30.01	Boneless	Exempt	D	D
Edible Leftovers				
0206.10.01	Fresh or refrigerated	20	C	C
0206.21.01	Frozen tongues	20	C	C
0206.22.01	Frozen livers	20	C	C
0206.29.99	The rest	20	C	C
Processed Meats				
0210.20.01	Meat	10	C	C
0210.90.01	Innards or bovine lips, salted	10	C	C
1602.50.01	Innards or bovine lips, cooked, hermetically packed.	20	C	C

Source: Suárez Domínguez and López Tirado (1997). C stands for a linear phase out in ten years beginning on January 1, 1994, which means that the product will be tariff free by January 1, 2003. D means that the product was already tariff free at the moment of negotiations.

Under NAFTA, the United States and Canada removed the import tariffs applied on live Mexican cattle. Meat exports from Mexico are exempted from both the Canadian Meat Import Act and the U.S. Meat Import Law. The main barrier to Mexican exports to the United States has been the sanitary standards related to bovine tuberculosis, and inspection standards for Canada. Exports to both countries have been limited to the 12 states that are free of cattle ticks.

NAFTA has enhanced the chances of the livestock and feeder cattle industries for accessing grains and inputs at international prices, improved the market access opportunities for all participants, improved the investment environment in the sector and implemented trade dispute settlement mechanisms. But it has also made evident some of the problems faced by the industry that must be corrected in order to improve our competitiveness.

One problem that we face in Mexico, that became quite evident with the opening of the economy, is the lack of a consistent norms and standards system, as well as certification schemes. All norms and standards that have been implemented refer to obligatory conditions affecting human health. For example, we have 25 Mexican Official Standards that regulate aspects related to control of bovine tuberculosis, meat verification procedures, analysis of toxic residuals, construction and characteristics of TIF slaughterhouses, industrialization of meat products among others.

But we still have a vacuum in the areas of quality (which is considered as an optional standard). Consumer information is another area with problems. With an under-regulated market and the inability to supervise the norms, there is still a great deal of anarchy in the markets. This is a problem because our lack of standards opens the door to imported products that are not certified and might have sanitary problems.

About 96 percent of our total cattle / beef trade is done with the United States. In 1997, 51.4 percent of all import values coming from the United States were boneless bovine meats, fresh or frozen, followed by cattle for slaughter (22.8 percent) and boneless meat (6.7 percent). It should be noted that due to the severe decrease in the Mexican cattle herd, in 1997, the imports of breeding animals, milk cows and other high quality animals increased 191.3 percent, 201.4 percent and 136.8 percent, respectively. Nevertheless, these goods have a share of 9.3 percent in total cattle and beef imports. One of the main reasons why Mexican producers have not been able to import more live cattle is the difficult conditions imposed by the Mexican banks in order to access to EEP, EDP and other CCC programs (see Table 10).

Because of the difficult conditions that cattle raisers have faced in the last years, most of them are classified as high risk clients by the commercial banks, thus increasing the level of guarantees required to access to import credits. This is why in fiscal years '95-96 and '96-97, 125 million dollars per year were allocated in credits for buying cattle under the CCC´s GSM-103 program. In these two years, only 5 million dollars were used. For 97-98 fiscal year there 100 million dollars allocated for this purpose.

Table 10: Mexican Cattle/Meat Imports from United States, 1990-97

Harmonized System Code	*Description*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
		Thousands of US Dollars							
01021001	Pure race breeders	13,086.7	24,714.4	23,050.8	18,694.7	24,574.8	9,702.9	11,052.8	32,197.1
01029001	Milk cows	40,051.5	33,663.7	28,259.6	20,710.4	25,144.2	4,877.4	5,176.9	15,604.9
01029002	With pedigree or with a high register certificate, except what is comprised in fraction 0102.90.01.	1,954.8	3,211.8	3,574.4	740.9	385.0	78.5	79.8	189.0
01029003	Bovines for slaughter, when imported by industrial De Abastos	48.6	162.6	213.6	0.0	0.9	0.0	445.3	0.0
01029099	The rest	4,878.6	96,210.6	112,740.0	31,326.1	63,309.1	3,688.6	61,803.3	117,684.9
02011001	Carcass or half carcass, fresh or frozen	25,624.8	53,297.1	29,990.1	9,542.1	8,961.9	517.2	3,961.9	9,509.1
02012099	The rest of the cuts (pieces) with bone fresh or frozen.	24,634.1	58,382.0	50,205.1	25,709.6	33,803.7	8,072.1	18,030.9	33,543.8
02013001	Boneless bovine meat fresh or frozen.	4,994.3	42,277.2	120,018.5	90,532.0	218,476.7	72,015.0	122,167.7	265,194.6
02021001	Bovine meat in carcass or half carcass, forzen.	4,545.8	5,540.4	1,987.6	237.8	654.3	3.0	127.6	48.0
02022099	The rest of the cuts (pieces) with bone.	7,860.9	7,287.3	7,523.3	3,226.4	6,021.3	3,734.4	4,328.5	7,066.1
02023001	Boneless	28,984.8	55,800.0	53,598.1	18,435.9	41,630.4	20,736.2	32,227.2	34,763.5
02102001	Meat of the bovine species.	20.9	28.4	111.9	131.4	148.2	14.7	6.4	27.2
02109001	Innards or bovine lips, salted.	91.3	17.4	0.0	1.9	0.0	0.4	0.0	0.0
	TOTAL	**156,777.0**	**380,592.9**	**431,272.9**	**219,289.2**	**423,110.6**	**123,440.6**	**259,408.4**	**515,828.2**

Source: SECOFI

It must be noted that after years of steady growth, U.S. beef exports to Mexico fell about 60 percent in value during 1995 and 1996, due to the loss of purchasing power brought about by the devaluation of the Mexican peso. Another important factor was the higher slaughter levels registered in Mexico during these years. Higher slaughter numbers were due to the fact that producers decided to get rid of their cattle herds because of the high prices of grain and the critical weather conditions faced in some northern states of the country. In 1997, the situation was back to normal.

In the case of Canada, our imports consist mainly of Breeders (66.3 percent) and milk cows (21.7 percent) (see Table 11).

Table 11: Mexican Cattle/Meat Imports from Canada, 1990-97

Harmonized System Code	*Description*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
		Thousands of US Dollars							
01021001	Pure race breeders.	400.1	3,763.2	4,414.6	3,302.8	6,173.8	549.6	6,352.4	16,071.9
01029001	Milk cows	9,312.7	15,146.4	19,812.4	14,766.7	14,994.4	3,058.6	3,063.5	5,266.1
01029002	With pedigree or with a high register certificate, except what is comprised in fraction 0102.90.01.	289.3	56.6	136.0	151.0	155.2	0.0	0.0	0.0
01029003	Bovines for slaughter, when imported by industrial De Abastos	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01029099	The rest.	2.4	0.0	77.4	119.2	47.3	0.0	108.3	62.5
02011001	Carcass or half carcass.	0.0	131.5	0.0	0.0	0.0	0.0	0.0	0.0
02012099	The rest of the cuts (pieces) with bone.	0.0	0.0	10.7	213.9	91.9	8.3	0.0	14.8
02013001	Boneless	39.8	107.9	621.9	380.4	816.1	633.9	542.0	1,925.0
02021001	Carcass of half carcass.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02022099	The rest of the cuts (pieces) with bone.	0.0	5.6	1.1	0.0	0.2	9.3	1.5	44.6
02023001	Boneless	289.3	4,177.3	1,475.0	206.6	286.7	781.8	835.0	831.5
02102001	Meat of the bovine species.	0.0	0.0	0.0	34.3	8.0	13.8	3.2	0.0
02109001	Innards, or bovine lips, salted.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	TOTAL	**10,333.6**	**23,388.6**	**26,549.2**	**19,174.8**	**22,573.6**	**5,055.3**	**10,906.0**	**24,216.3**

Source: SECOFI.

With respect to exports, Mexico has traditionally concentrated on live cattle (96 percent of total export values). The United States sells meat and livestock to Mexico, buying mainly feeder cattle. The transportation of meats between Mexico and the United States is done by trucks, because Mexican rail cars are not refrigerated. Most United States exports of meat and cattle go through the Texas border points of Laredo, Hidalgo, El Paso, and Santa Teresa. Live cattle are also trucked into Mexico, although rail is used in some cases. Most of the cattle are hauled to the northern rangelands of Mexico, to privately-owned and operated farms. The trucks are cleaned and then must be inspected by Mexican customs officials. The Mexican Government requires the CNG to handle all transfers of livestock through customs. From Mexico to the United States, inspection by USDA officials is done mostly at the crossing point in Laredo, Texas[4] (see Table 12).

[4] See USDA-ERS (1996).

Table 12: Mexican Cattle/Meat Exports to the United States, 1990-97

Harmonized System	*Description*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
		Thousands of US Dollars							
010210	Pure race breeders	0.0	0.0	0.0	0.0	0.0	0.0	72.9	308.1
01021001	Pure race breeders	35.6	121.7	293.2	17.5	86.6	243.8	0.0	0.0
01021002	Males with register	10.4	58.8	100.7	29.4	86.1	132.8	0.0	0.0
010290	The rest	91.0	0.0	0.0	0.0	0.0	0.0	127,312.7	197,761.7
01029001	Milk cows	522.5	2,307.1	10,211.4	53,134.5	55,480.0	107,846.3	0.0	0.0
01029002	Other animals of the bovine species	350,754.2	355,774.3	318,063.3	394,755.6	305,683.9	427,443.0	0.0	0.0
01029003	Bovines for slaughter, when imported by industrial De Abastos	62.6	4.0	115.3	95.8	196.4	97.4	0.0	0.0
01029005	Bovine meats with bone	5.2	25.9	0.0	0.0	0.0	0.0	0.0	0.0
01029099	The rest	6.7	14.7	204.8	0.0	0.0	0.0	0.0	0.0
020110	Carcass or half carcass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
020120	The rest of cuts, with bone	0.0	0.0	0.0	0.0	0.0	0.0	56.2	0.0
02012001	Bobine meat with bone	1.9	0.0	1.3	6.4	52.6	69.1	0.0	0.0
02012002	Bovine meats, cut	101.8	0.0	0.0	2.9	0.0	0.0	0.0	0.0
020130	Bovine meat without bone	0.0	0.0	0.0	0.0	0.0	0.0	2,008.8	1,688.7
02013001	Bovine meat without bone	86.3	51.2	123.4	523.1	1,591.2	1,244.9	0.0	0.0
02013002	Bovine meat, cut	0.0	0.0	22.0	14.9	56.0	0.0	0.0	0.0
020210	Frozen carcass of half carcass	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0
020220	The rest of the cuts (pieces) with bone, frozen	0.0	0.0	0.0	0.0	0.0	0.0	44.4	431.3
02022001	The rest of the cuts with bone, frozen	0.0	0.0	6.5	117.8	6.9	61.4	0.0	0.0
02022002	The rest of the cuts, frozen	876.7	0.5	103.9	24.1	0.0	0.7	0.0	0.0
020230	Boneless	0.0	0.0	0.0	0.0	0.0	0.0	7,518.4	6,026.5
02023001	Boneless	3,043.5	3,996.2	3,250.7	2,903.6	2,207.5	4,207.1	0.0	0.0
02023002	Boneless	3,049.8	45.1	23.0	0.0	968.4	154.8	0.0	0.0
	TOTAL	**358.648.3**	**362.399.4**	**332.519.6**	**451.635.1**	**366.415.7**	**541.501.2**	**137.013.2**	**206.216.5**

Source: SECOFI.

One of the critical points that determines the competitiveness of the feedlots and cattle raising activities is the access to grains at competitive world prices. The problem is not really the access or the price, since in the last four years the exercised assignments of corn under the NAFTA quota have been below the authorized amounts, as we will see.

Under NAFTA, Mexico granted duty-free minimum access of 2.5 million tons and 1000 tons (to be increased by 3 percent a year) for maize imports from the United States and Canada respectively. Both in 1994 and 1995 the tariff quota was filled. In 1996, due to critical conditions in some northern states of Mexico, the Secretariat of Commerce (SECOFI) authorized a substantial increase in the duty free NAFTA quota. The quota was allocated via prior assignment to starch factories (about 40 percent), the feed sector (33 percent), flour companies (26 percent) and cereal traders (1 percent) in 1994 and via prior assignment (93 percent) and "first come first served" basis (7 percent) in 1995. The purchases of CONASUPO (The National Company of Popular Subsistence) are used to ensure the supply of corn for

the production of tortilla under Government subsidized programs. The base above-quota tariff was set at 215 percent to be reduced by 24 percent by 2000, and then gradually phased out between 2000 and 2008[5] (see Table 13).

Table 13: Mexican Duty Free Tariff Quota for Corn Under NAFTA. Allowed and Used Assignments by Sector, 1994-96

SECTOR	1994		1995		1996	
	ALLOWED	USED	ALLOWED	USED	ALLOWED	USED
	Tons					
PRIOR ASSIGNMENT	**2,562,533**	**2,276,474**	**3,204,010**	**2,405,682**	**9,532,124**	**5,909,037**
Starch	948,236	918,167	904,714	846,190	1,350,500	1,244,744
Flour	636,776	585,672	361,081	268,225	1,569,616	1,223,555
Cereals	25159	11797	8,000	174	21,000	---
CONASUPO	---	---	65,000	45,000	1,701,300	1,533,057
All Livestock Products	952,362	760,647	1,611,215	1,209,772	3,726,708	1,326,076
Traders	---	---	254,000	36.320	1,163,000	581,605
"FIRST COME FIRST SERVED"	---	---	**165,000**	**184,834**	---	---
All Livestock Products	---	---	---	44,765	---	---
Traders	---	---	---	140,068	---	---
TOTAL	**2,562,533**	**2,276,474**	**3,369,010**	**2,590,515**	**9,532,124**	**5,909,037**

Source: SECOFI.

In 1997, livestock and feed producers were allowed to import one million tons of corn, but only used its right to import 514 thousand tons. Feed producers imported 84.2 percent of its total authorized quota, while feedlot owners and poultry producers only imported 58.3 percent and 39.1 percent, respectively. In fact, the total used imports under the NAFTA corn quota were below the total NAFTA corn quota for 1997 (see Table 14).

Table 14: Mexican Duty Free Tariff Quota for Corn Under NAFTA. Allowed and Used Assignments by Sector, 1997

SECTOR	JAN - DEC. 1997	
	ALLOWED a/	USED b/
	Tons	
STARCH	1,696,996	1,646,459
FLOUR	325,000	210,071
CEREALS	85,000	68,410
LIVESTOCK	1,004,767	514,797
Feed Producers	242,335	203,954
National Assoc. of Manufacturers (CANACINTRA)	444,217	175,433
Poultry Producers	247,000	96,488
Feedlot owners	40,800	23,804
National Federation of Livestock Producers (CNG)	3,000	---
Others	27,415	15,117
TOTAL	**3,111,763**	**2,439,737**

Note: a/ Considers 114,000 tons allowed until July 31; b/ Includes 45,344 tons allowed until September 30, 1997.
Source: SECOFI.

[5] See OECD (1997b).

As we can see, the livestock subsector has been granted substantially more access to the corn import quotas than they have used. In fact, in 1997 the import requirements were below the NAFTA quota. That suggests that access to grain is not a problem. In the case of sorghum all tariffs were removed for the United States and Canada, but a 15 percent seasonal tariff is still applied on a Most Favored Nation Basis under the Uruguay Round Agreement.

The real issue seems to be the lack of financial schemes for financing domestic grain inventories. In Mexico, crops tend to be very seasonal, that is, about 70 percent of the grain crops are harvested in very short period of time. In the past, producers used to sell their grains to the state-owned enterprise CONASUPO, but since 1991 free market conditions have applied in Mexico. The problem is that the financial cost for grain inventories in Mexico are extremely high due to the high interest rates, lack of infrastructure and risk management markets. That makes buying domestic grain very expensive. There have been some experiments trying to use external resources (like using the recycling of CCC funds for financing domestic inventories, or implementing commodity inventory financing options with international banks), but they have been unsuccessful, mainly because of the guarantees that Mexican banks are asking from producers.

A recent development in Mexico is that foreign corporations, like Farmland for example, are directly investing in the production of livestock in Mexico. At the same time, they are financing feed projects as well as the direct import of grain for their partners, providing funds at competitive interest rates.

DIRECT FOREIGN INVESTMENT

One of the most important impacts of NAFTA and the reforms to the legal framework of the Mexican agricultural sector is the flow of direct foreign investment to the Mexican countryside. By the end of 1997 there were 152 firms with direct foreign investment directly participating in primary activities. The direct foreign investment in the agrifood sector totaled 2.3 billion dollars in 1997, with a 1994-97 average participation of 18.4 percent in total foreign investment (see Table 15).

Table 15: Direct Foreign Investment in Mexico, 1994-97

SECTOR	*1994*	*1995*	*1996*	*1997*	*Accumulated Investment 1994-1997*	*% Share*
			Million US Dollars			
Agriculture	7.9	8.9	23.2	0.80	40.9	0.1
Food, Beverages and Tobacco	1,761.4	604.6	452.2	2,333.1	5,151.3	18.3
AGRIFOOD SUBTOTAL	1,769.3	613.5	475.4	2,333.8	5,192.1	18.4
Other Sectors	8,411.0	7,049.9	5,646.5	1,873.4	22,980.8	81.6
TOTAL DIRECT FOREIGN INVESTMENT	10,180.3	7,663.4	6,121.9	4,207.3	28,172.9	100.0

Source: SECOFI, Dirección General de Inversión Extranjera. 1997 data updated to August.

Around 65.1 percent of the direct foreign investment in the Mexican Agrifood sector comes from the United States. Canada participates with a 3.3 percent, and non-NAFTA countries with the other 31.6 percent (see Table 16).

Table 16: Country of Origin of Direct Foreign Investment in the Mexican Agri-Food Sector

Country	*Firms*	*% Share*
NAFTA Countries	**104**	**68.42**
United States	99	65.13
Canada	5	3.29
Non-NAFTA Countries	**48**	**31.58**
Spain	7	4.61
Chile	6	3.95
Holland	6	3.95
Germany	5	3.29
Cayman Islands	4	2.63
Other Countries	20	13.15

Source: SECOFI, Dirección General de Inversión Extranjera. 1997 data updated to August.

With respect to specific areas of investment, crops, horticulture and other plants account for 90.7 percent of direct U.S. foreign investment in the agricultural sector, while livestock account for about 9.34 percent of the capital (see Table 17).

Table 17: Direct Foreign Investment from the U.S. in Agriculture and Livestock, 1994-97

					ACCUMMULATED	
ACTIVITY	*1994*	*1995*	*1996*	*1997*	*1994-97*	*% SHARE*
	Thousands of US Dollars					
AGRICULTURE	**5,720.1**	**5869.3**	**22,059.0**	**264.3**	**33,912.3**	**90.66**
Vegetable and Flower Growing	2,460.2	3,625.2	19,956.0	9.5	26050.6	69.65
Fruit Trees	1,409.9	1,457.2	2,097.1	0	4,964.2	13.27
Experimental Fields	499.0	718.4	0.2	0	1,217.6	3.26
Other	1,351.0	68.5	5.7	254.8	1,679.9	4.48
LIVESTOCK	**1,728.5**	**1,173.8**	**513.5**	**76.6**	**3,492.4**	**9.34**
Livestock associated to other activities	1,175.8	525.9	502.7	0	2,204.4	5.89
Poultry	490.6	643.5	0	73.4	1,207.5	3.23
Honey	31.2	0	0	0	31.2	0.08
Other	30.9	4.4	10.8	3.2	49.3	0.14
TOTAL	**7,448.6**	**7,043.1**	**22,572.0**	**340.9**	**37,404.7**	**100**

Source: SECOFI. 1997 data updated to August.

Two things must be stressed: there has been a steady decrease in foreign investment in the livestock sector, and direct investment in cattle production is very low.

CONCLUSIONS

Mexico-U.S.-Canada live cattle-beef trade has few tariff barriers and seems to be a good example of specialization based on competitive advantages of the three countries. Mexico's comparative advantage appears to be in the production and export of feeder cattle and the importation of U.S. beef for supermarkets and restaurants.

NAFTA has improved access to grains and inputs, as well as the market access conditions. It has also created a better investment environment and trade dispute settlement mechanisms. But it has also made evident some challenges that we must face in order to improve our competitiveness.

Live cattle production can be improved with larger scales of production. This involves more intense work around the organization of producers and vertical integration around certified slaughterhouses. Tha Alianza para el Campo Programs are aiming to help producers to reach these objectives.

One of the most critical issues which would improve the competitive position of Mexican beef, is that of Norms, Standards and certification systems, specially in the quality and consumer information sides.

Currently, there are many opportunities for foreign investment in the sector. The opportunities are especially attractive for firms that can provide credit at internationally competitive rates. Producers are still facing problems of accessing competitive credit conditions for importing live animals for replenishing the cattle stocks and for financing the domestic grain stocks at competitive international interest rates.

An important vertical integration point is the TIF plants. TIF plants are the only ones that can ensure quality for consumer and meat exports. Integration of cattle raisers with TIF plants is something that must be considered, but incentives for the use of TIF plants must be implemented.

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SMALL-SCALE CORN AND LIVESTOCK MEXICAN FARMERS

Antonio Yunez-Naude

INTRODUCTION

The North American Free Trade Agreement (NAFTA) combines countries with deep economic differences in a process of trade liberalization, and this experience was unknown worldwide. The contrasts between Mexico and its other two North American partners are striking in terms of their agricultural structures and this is particularly so between the Mexican and the U.S. corn subsectors. This difference has lead some analysts and politicians to predict that with NAFTA, corn production in Mexico will tend to disappear and hundreds of thousands of Mexicans will be displaced from the rural sector.

Mexico's rural economy is itself heterogeneous. This, in addition to the contrasts between the agricultural sectors of the North American countries, raises doubts about the possibility of attaining economic harmonization of the grain and livestock subsector of the three countries.

The main purposes in this paper are to analyze quantitatively the impacts of policy reforms on small-scale corn and livestock farmers in Mexico, and to discuss some of the results in the context of the issues of concern in this Workshop i.e., competition of the North American corn and livestock subsectors and their economic harmonization in the three countries.

The paper begins with an overview of the adjustment processes that Mexico's agricultural sector has experienced since the beginning of the nineties; and discussion of the expectations about the impacts on Mexican agriculture that this process of reforms may bring about, and discussion of characteristics of the Mexican corn and livestock subsectors. With this background, our analytical model—a village-wide general equilibrium model of rural households—is used to quantify the impacts

of policy changes on small-scale corn and livestock producers. The application of this model is to a typical village in Central Mexico. The paper ends with a discussion of our findings in relation to the NAFTA and agricultural policies.

THE ADJUSTMENT PROCESS

A decade before the beginning of NAFTA's negotiations, the governments of Mexico began a radical change in development strategy. It has consisted in moving public policy from import substitution to outward orientation, which has meant considerable reduction of government intervention in the economy.

Among other measures, the liberalization process in agriculture consisted of abolition of import controls of "basic staples", elimination of producers' price supports, reduction or elimination of State owned enterprises' activities in buying, importing, storing, processing and selling staples such as corn, beans, rice, wheat, oilseeds and barley, reduction of government subsidies in rural credit and insurance, privatization of agricultural parastatals and the irrigation system, and liberalization of property rights in land (the latter known as the Ejidal Reform. See details in Yunez-Naude, A.).

For Mexico, NAFTA cannot be taken exclusively as an accord to liberalize agricultural trade among the three North American countries. Until the eighties, the agricultural sector of Mexico was heavily influenced by governmental policies and interventions. The domestic agricultural reforms that the Salinas Administration initiated before and during the beginning of the negotiations were a signal to the United States that the Mexican purposes of liberalizing the sector were serious and lasting. Those reforms are still in place and in line with the commitments of the last two Mexican governments under NAFTA and the Uruguay Round.

The liberalization process included the Ejidal Reform and a major reduction of the activities of CONASUPO (The National Company of Popular Subsistence), the major governmental agricultural agency regulating prices, and involved in trade, storage, processing and distribution of staples. These reforms meant the abolition of prohibitions of leasing and selling Ejidal lands (those distributed to peasants after the Revolution of 1910), and the elimination of the support prices CONASUPO granted to 12 crops and to milk, but not to corn and beans.

Under NAFTA, Mexico implements tariff rate quotas (TRQs) to agricultural commodities that the Salinas' Administration considered sensitive for Mexican producers. They include corn, dry beans and some animal products (dried milk) (Shagam, S.D. and D. Plunkett). The Mexican government plans to eliminate the TRQs for corn and milk by the year 2003. Up to the beginning of the nineties, CONASUPO controlled the trade of corn, imported the grain to cover the differences between domestic supply and demand and settled a producers' support price (or guaranteed price) higher than the international price. CONASUPO still intervenes in the corn and powdered milk markets by importing them and, together with SECOFI (the Ministry of Commerce), by allocating their quotas. CONASUPO is still the sole

importer of milk powder to implement its program of milk distribution for the young poor; it then auctions the balance of its purchases to the private sector. In the case of corn, it still subsidizes millers for the production of "tortillas" for the consumption of the poor. However, private direct imports of corn are now allowed, with part of the quota assigned to the private sector's requests.

In addition, CONASUPO, together with the Ministry of Commerce, establish a producers' "minimum" or "intervention" price for corn. For milk (and for other crops) the government negotiates prices with their producers. Domestic price of corn is fixed taking into account macroeconomic phenomena, the grain's international price and transportation costs. CONASUPO is now "a last instance buyer" of corn if farmers cannot get a higher price in the market. However, government interventions in the corn market have meant that the domestic price of corn is still considerably higher than its international price.[1] Consequently, reduced intervention is still a policy option to fully liberalize corn market as reform programs continue. This is the case of corn and powdered milk under NAFTA. For these commodities, the tariff rate quotas established by Mexico in NAFTA will be eliminated between the years 2003 and 2008.

EXPECTATIONS AND FACTS

The last two Administrations and the current one expect that, with economic liberalization, macroeconomic stability is going to be achieved. In addition, they expect that reform, together with NAFTA, will promote savings and foreign investment, and a new vigorous stage of sustained economic development. With respect to the agricultural sector, the reduction of state intervention is expected to lead to efficient use of the resources of rural Mexico. Market forces will reallocate scarce rural resources to activities such as horticultural and livestock production, where the country has comparative advantage. Governments have not been too worried about the consequences of this change on food self-sufficiency and on rural emigration.

In contrast, the critics of the liberalization processes and NAFTA are worried about food self-sufficiency and pessimistic about the absorption by industry and services of workers displaced from the rural economy. Based on the argument that Mexican staple and livestock producers are not competitive and on the fact that a big proportion of the labor force is engaged in these activities, they foresee that, with trade liberalization, the domestic supply of food will be sharply reduced and millions of people will be displaced from the rural sector (Calva, 1995).

Mexico's agricultural sector has grown at rates below its population growth since the seventies (that is before and after the reforms). However, domestic agricultural supply did not sink from 1991 to 1996. Corn production increased during 1992

[1]According to official data, the difference between the corn support price and the average import price of corn (volume of corn imports divided by its value) is around 40 percent. A similar difference is present in the relation between the average domestic price of corn and its average import price (Source: Mexican Ministry of Agriculture).

and 1993 and remained at this level during 1994-96 (SAGAR, 1994). In part, this latter phenomenon is explained by the fact that government still supports corn production, which has meant a higher relative price of corn with respect to other competitive crops. It may also be related to the fact that a portion of small-scale farmers producing corn is isolated from the agricultural products' markets and/or to policy changes. (Notwithstanding, their production is considered in government statistics).

STRUCTURAL ADJUSTMENT AND SMALL-SCALE FARMERS

Most of the studies, discussions and official expectations on the effects of the reforms and NAFTA on the agricultural sector are too aggregated and do not emphasize the enormous heterogeneity prevailing in Mexico's countryside. This is the case of the production of corn and livestock and its products, where large, entrepreneurial, modern and capitalized farms coexist with small-scale and poor farmers.[2] It is also frequent in traditional economic analyses to ignore the fact that, historically, most of the corn production—the basic foods in Mexicans' diet—is done not by modern agriculture, but by family units of small-scale production and consumption, using rainfed land, and whose members are also engaged in activities other than the production of corn. These additional sources of small-farmers' income include livestock, an activity that ranges from cattle raising to the production of eggs. A typical family agricultural unit in Mexico has therefore diversified sources of income, coming from the involvement of their members in crop production, livestock, articrafts, commerce and in regional, domestic and the U.S. labor markets (Taylor, J.E. and A. Yunez-Naude, Ch. 4: forthcoming).

The significance of small-scale farmers in the production of corn is illustrated by the fact that this grain is by far the most important crop in Mexico with around 70 percent of it is obtained in rainfed farms whose owners have around two hectares of land (Zedillo, E. and Taylor and Yunez-Naude, op.cit.).[3]

Another feature of Mexico's agricultural sector is that an important portion of staple and livestock production comes from small-scale farmers which is not marketed—it goes to the family's own consumption—using family (non-waged) labor.[4] This means that a segment of small-scale farmers face incomplete agricultural product and labor markets, making the notion of competition an inappropriate analytical tool.

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[2]For example, during 1991 farmers with more than 8 hectares (ha.) of irrigated land cropped with corn obtained more than 5.5 tons per ha. of the grain, whereas units with 2.3 ha. of rainfed land got less than 1.4 tons per ha of cropped corn (Yunez-Naude, A. et al.: 76). Similar contrasts exist in Mexico's livestock sector. For example, 67 percent of the bovine herd producing milk is also used by small farmers to produce meat. This subsector only contributes to 30 percent of the domestic supply of milk, whereas the specialized farmers produce 54 percent of the total supply with just 8 percent of the bovine milk-producing herd (Davalos Flores, J.L.)

[3]During the first half of the nineties, the contribution of corn to agricultural GDP was 15 percent, its production employed 14.2 percent of workers engaged in agriculture and its cultivation occupied more than 35 percent of total cropped land. In contrast, the combined contribution to agricultural GDP, employment and used land of the three crops that follow corn (sugar, sorghum and beans) is less than that of corn (Salinas de Gortari, C. and J.L. Calva).

Rural Mexico is hence characterized by a patchwork of staple surplus-producing regions and local economies producing little or no surplus for regional or national markets. In the latter economies, the price of staples is likely to be endogenous and so, their producers will not be affected directly if the government decides to eliminate their price supports. Notwithstanding the isolation of a portion of small-scale farmers in staple and livestock markets, they are linked to regional and national inputs and manufacturing markets, as well as to the national and international labor markets. A typical Mexican rural household requires manufactured goods produced elsewhere in Mexico, and members of the unit work for a wage in the region, in the rest of Mexico or in the United States. Part of the income earned by family members in these labor markets is sent as remittances to the family unit, which are frequently an important component of the unit's budget.

Explicit consideration of these phenomena is fundamental to economic harmonization of North American agricultures and for doing rigorous impact analyses of NAFTA, policy reforms and alternative agricultural development strategies. Unfortunately, nationwide data on factor use, production, consumption and market linkages at the rural household level are not available. Therefore, empirical studies of these characteristics have to rely on surveys designed for these purposes.

Professor J.E. Taylor University of California (Davis), and I have been coordinating such efforts during the last years by doing surveys to rural households, representative of small-scale farming in Mexico. Among other information, the surveys capture data of representative households' production of agricultural and non-agricultural commodities; on their consumption of goods and services; on the use of family labor inside and outside the unit; and on the households' relations with village, regional, national and foreign (US) input, product and labor markets. With this data base, we have built village-wide general equilibrium models to estimate the impacts of policy reforms on small-scale staple and livestock producers of rural Mexico.

VILLAGE GENERAL EQUILIBRIUM MODELING

The village-wide model we propose to use to estimate the impacts of policy reforms on small-scale corn and livestock-producing farms has a social accounting matrix (SAM) as its data base.[5] The village SAM is built from information obtained for this purpose in surveys applied to a sample of representative households. The village general equilibrium model (VGEM) integrates micro-economic, household-farm modeling into a village general-equilibrium framework, making it possible to capture both direct and indirect impacts of policy and other exogenous changes on rural economies. This modeling approach captures the diversified nature of rural

[4]An official national survey on corn production during 1991-92 shows that more than 30 percent of it is used for the production units' own consumption (human, animal or as seeds for future cultivation), and that around 20 percent of the total labor costs come from use of family labor. See Yunez-Naude, A.et al., : 81-2).

[5]The model was built in a joint research effort with Prof. J.E. Taylor, financed by the William and Flora Hewlett Foundation and the Pacific Rim Research Program (University of California).

households' activities and second round effects of policy changes, through their impacts on expenditures and production in household-farm economies. Economic linkages among household-farms transmit direct impacts of policy changes to other households inside and outside the rural sector. These linkages may either dampen or magnify the effects of policy reforms, and they may alter or even reverse the impacts of policies on production, incomes and migration.

This technique can be used to develop stylized village models to explore the implications of failure in selected rural markets in shaping agricultural and trade policy impacts. This is the case of market failures caused by high transactions' costs in the corn sector, which buffer the rural economy from changes in its price.

The VGEM is applied to a typical village in the central State of Michoacan: it is formed by corn and livestock farmers, whose family members are also engaged in non-agricultural production as well as in waged labor and in migration activities.[6]

The Model

In our VGEM we consider explicitly important features of small-scale agricultural production in Mexico, such as the participation of households in local and national inputs, product and labor markets. We also take into account migration to the United States, that is, the main and usually only linkage of Central Mexico's small-scale family farmers with the "rest of the world." The model captures production and expenditure linkages within the village and between the village and the rest of Mexico, including village households' consumption and production demand for manufactured goods. Mexico-to-U.S. migration and internal migration are modeled explicitly as a function of the returns to migration and the returns to family labor in the village.

The model consists of five blocks of equations: (1) a household-farm production block, (2) a household-farm income block, (3) an expenditure block, (4) a set of general equilibrium closure equations, and (5) a price block. (The model equations are presented in Appendix 1 of Taylor, J.E., A. Yunez-Naude and S. Hampton).

The household-farm production sector includes three productive sectors (corn, livestock and non-agricultural), and one commercial sector that serves to "import" primarily manufactured goods into the village from the rest of Mexico. Production in each of the sectors is carried out with four factors: family labor, hired labor, physical capital and land. Contrasting traditional neoclassical household-farm models, it is not assumed that family and hired labor are perfect substitutes. The production technology in each sector is specified as Cobb-Douglas. The demand for non-factor (intermediate) inputs, including manufactured inputs imported into the village (for example, fertilizer for corn production), is determined through the use of fixed input-output coefficients.

[6]This methodology can easily be extended to other typical villages and to encompass larger regions, including village-town economies. We have some of this research underway.

Household-farms are assumed to maximize utility defined on consumption goods and leisure. On the production side, this implies maximizing net farm income from the four production activities given market prices for output and either market or shadow prices for factors of production and intermediate inputs. Endogenous shadow prices include the family wage, which equals the marginal utility of leisure divided by the marginal utility of income. Physical capital and land inputs are fixed in the short run, but family and hired labor are variable inputs.

The household-farm sector in our model consists of three groups: small or subsistence farm households with fewer than 2 hectares of land, a middle group with 2 to 8 hectares of land, and largeholder households with more than 8 hectares of land. Household-farm income is the sum of wage income; capital, land and family-labor value-added from household-farm production activities; and migrant remittances. Mexico-to-U.S. migration and internal migration are a function of the differential between household group-specific average migrant remittances and the shadow price of family labor in village production activities. The expenditure block includes the consumption demand for village products and manufactured goods produced elsewhere in Mexico, leisure, savings, including investments in physical and human capital (schooling), taxes, and household-to-household transfers.

The general-equilibrium closure equations include local market-clearing conditions for factors and goods, a village savings-investment balance, and a village trade balance equation. For goods and factors for which the village is a price-taker in regional markets (that is, village tradeables), the market-clearing conditions determine net village marketed surplus. For nontradeables, they determine local prices. The savings-investment balance constrains village investments in physical and human capital to be self-financed, that is, out of household-farm savings. The trade equation constrains the value of village exports of goods and factors to equal the value of village imports. It represents the redundant equation in our village Computable General Equilibrium (CGE) system.

Prices of village tradeables are fixed, determined by markets outside the village. Prices of village nontradeables are determined by the interaction of local supply and demand. Family wages adjust to ensure that family time allocated to village production activities, to migration and to leisure equals families' total time endowments. Because land is assumed fixed, its price is also endogenous, equal to its marginal value product in village production activities. It is most appropriate to view these VGEM as stylized models of Mexican village economies in different market settings, estimated with household-farm survey data.

Policy Simulations and Results

Three sets of simulations are discussed using our VGEM to explore the impacts of actual and alternative agricultural policy changes on production, incomes, migration and trade. The first simulation explores the impact of a 40 percent reduction in government price supports for corn. This decrease is similar to the prevailing difference between the domestic and the international price of corn and is

plausible in areas of rural Mexico where farmers had relatively easy access to the government guaranteed price such as villages located near CONASUPO's purchase points. At the other extreme, villages that have not had access to the guaranteed price due to high transaction costs of getting harvests to government purchase points are not likely to experience price declines of this magnitude.

The second experiment simulates PROCAMPO, a government program in which direct subsidy payments compensate farmers for the decreased value of their harvests resulting from lower staple prices. This set combines a 40 percent staple price decrease with a subsidy payment equal to 40 percent of the base value of the farmers' corn harvest.

The third simulation explores an alternative to PROCAMPO, the allocation of government savings from reducing corn price supports to increase staple productivity by 10 percent.

Two models were estimated to include the effects of policy changes in different market settings: Model 1 assumes perfect commodity and hired labor markets (that is, all goods and hired labor are tradeable), and in Model 2 the village is completely cut off from the outside market of corn and labor, and so their prices are endogenous.

First Experiment. A summary of the findings from the first simulation using Model 1 is reported in the first column of the Table of Results.[7] The 40 percent drop of corn-price reduces corn output by 28 percent, revealing a high output-price elasticity of corn production. This drives down the shadow value of family labor and land, but by a small percentage amount compared to the magnitude of the staple price change (by 0.5 percent and 2.2 percent, respectively). In response to the decreased profitability of producing corn, households reallocate resources away from the grain production toward other activities, with output increases of 1.8 percent in livestock and 1.1 percent in nonagricultural production. As the shadow value of family labor in village production decreases, migration increases (by 1.3 percent), and family leisure demand also rises (by 2.4 percent).

Total household-farm income declines, but by a small amount relative to the corn price change. Nominal income falls 1.6 percent. The high degree of diversification in the village means that, *ceteris paribus*, a given percentage decrease in corn price translates into a much smaller percentage decrease in total income. The impact of the price change on nominal income is dampened further by the reallocation of family resources away from corn production. In real terms, small-holder households benefit from the income change; their average income rises by just under 9 percent. These households are marginal producers of corn and therefore lose relatively little on the production side. As heavy consumers of corn, however, they benefit from the price reduction on the consumption side. Subsistence household-farms also benefit

[7]The figures in the table show percentage changes with respect to the base model solution. Model 2 of this experiment is not included in the table since, due to its isolation from the staple markets, the reduction of the price of corn has no effects on the village's economy.

from the expansion of nonfarm activities, to the extent that they supply labor to those activities, and from higher migration income. They lose to the extent they supply labor to corn producers.

Largeholder farms also benefit slightly in real terms (1.5 percent) from the corn price change. As growers of corn, they lose as a result of the price decrease. However, largeholder households are major producers of livestock, for which corn as feed is an input. They are also engaged in non-farm production, which increases as a result of the lower profitability of corn production. Finally, as consumers they benefit from the lower price of corn, although to a smaller extent than subsistence households because of their relatively low marginal propensity to consume grain.

Middle farmers benefit the least in real-income terms (1.0 percent). For this group, increased value-added from non-corn production, migration income and the benefits of a lower corn price on the consumption side barely compensate for the decline in income from corn production.

Corn price liberalization negatively affects trade linkages between the village and the outside world. As corn production contracts, purchases of intermediate inputs by village producers decline slightly (by 0.8 percent). The income elasticity of demand for manufactured goods produced outside the village is large, however. Hence, villagers' demand for manufactures contracts (by 1.6 percent) as a result of the income change. This finding reflects the importance of rural-urban growth linkages that imply negative repercussions of rural income declines for the urban economy.

Second Experiment. Our second set of experiments simulates the effect of a direct income subsidy designed to compensate staple producers for the negative income effects of price liberalization. Such a subsidy is the centerpiece of Mexico's PROCAMPO program, a decoupled support scheme for staple producers which began to be implemented in the autumn/winter season of 1993-94. As in the first experiment, we assume a 40 percent decrease in the price of corn. Payments to farmers are calculated as a function of the price change times baseline production. The results of the PROCAMPO simulation for Models 1 and 2 are displayed in columns 2 and 3 of the Table of Results.

Table 1: Table of Results (Percentage Change from Base)

Sector	Experiment 1	Experiment 2		Experiment 3	
	Price Reduction of Corn	PROCAMPO		Agricultural Productivity	
	Model 1*	Model 1*	Model 2**	Model 1*	Model 2**
Corn Production Prices	-28.3	-28.5	1.1	-17.6	10.6
	(-40.0)	(-40.0)	(-2.5)	(-40.0)	(-5.0)
Livestock	1.8	1.8	-0.3	13.0	11.4
Nonagricultural Production	1.1	0.1	-2.7	-2.3	-3.4
Shadow Prices					
Family Labor	-0.5	0.0	1.4	1.1	1.8
Hired Labor	N.A.	N.A.	-0.4	N.A.	-0.65
Capital	-1.6	1.4	-0.6	10.1	8.6
Land	-2.2	-2.3	0.2	8.4	10.3
Household-Farm Incomes					
Total Nominal	-1.6	0.9	6.9	3.5	5.1
Total Real	1.7	4.2	6.6	6.9	5.6
Real, by Household Group:					
Small-holder	8.8	10.3	3.2	14.6	6.9
Medium-holder	1.0	2.7	4.3	6.5	5.8
Large-holder	1.5	5.0	9.2	6.5	5.4
Consumption					
Leisure	2.4	4.2	4.7	5.4	3.3
Staples	64.2	68.0	3.4	72.3	10.6
Manufactures	-1.6	0.7	6.5	3.6	5.1
External Linkages					
Migration	1.3	0.1	-3.5	-2.8	-4.6
Net Imports:					
Intermediate	-0.8	-1.4	1.6	-0.4	1.2
Final	-2.5	1.0	9.5	5.7	7.9
Total	-1.6	-0.3	5.5	2.5	4.5

*Perfect commodity markets.
**Missing labour and staple markets.
Source: Taylor, J.E., A. Yunez-Naude and S. Hampton.

If the village is linked with the commodity markets (Model 1), the subsidy results in an overpayment to farmers, because the corn income loss is partially compensated by the reallocation of family resources into livestock and migration activities. Total households' nominal income increases slightly (by 0.9 percent) and real incomes rise for all household groups in the two models. In Model 1, the income subsidy completely nullifies the decrease in the marginal utility of leisure, and hence,

the shadow value of family labor, relative to Experiment 1. The subsidy therefore dampens the migration effect of price liberalization, resulting in little change from the base.

The PROCAMPO subsidy nearly eliminates the negative impact of staple price reform on trade linkages between the village and the rest of Mexico. However, demand for intermediate goods produced outside the village decreases by a greater percentage amount than before because of the negative effect of the income subsidy on village corn production. By contrast, consumption demand for village (final) imports increases by 1.0 percent. So the combined effect of production and consumption linkages is a small decrease (0.3 percent) in village imports from the rest of Mexico.

The third column of the Table of Results reports the simulated effects of PROCAMPO for a village characterized by a closed staple market (Model 2). In this case, households benefit from the income subsidy without being directly affected by the staple price change. The interaction of local supply and demand schedules for staples determines the endogenous local staple price. In the first instance, the PROCAMPO subsidy increases household-farm incomes by an amount equal to 40 percent of the base value of corn production. This increases household-farms' consumption demand for normal goods, including nontradeables (leisure and corn). The family wage increases and stimulates local production of the corn (by 1.1 percent). It, together with a higher family wage, produces a contractionary effect on nonstaple production, specially nonagricultural output, which falls by 2.7 percent. The higher family wage discourages migration; it decreases by 3.5 percent. That is, migrant workers are called home to benefit from the higher value of their labor. The migration effect of PROCAMPO in this closed staple-market economy stands in contrast to the findings reported by Model 1 (second column of the Table of Results).

The existence of village nontradeables creates local income linkages. They, together with the direct benefits of the subsidy, result in an increase in total household nominal income of 6.9 percent (in real terms, 6.6 percent). The impact on village trade is positive. The demand for intermediate goods from the rest of Mexico increases only slightly (1.6 percent) because of the contraction in nonagricultural production. However, higher household incomes stimulate trade in consumer goods (9.5 percent). As a result, total village imports increase by 5.5 percent.

Third Experiment. Our third experiment explores the implications of allocating fiscal savings from corn price liberalization to public investments designed to raise the productivity of family resources in village activities. The experiment is done to compare governmental policies' alternative to PROCAMPO. So, instead of direct income transfers, the public sector can use these resources in rural education or infrastructure works that raise productivity of family inputs in agricultural production. The simulation is based on an input productivity increase in the shift parameters in staple and livestock production by 10 percent.[8] This is equivalent to raising the marginal value products of all factors in crop and livestock production by 10 percent, as might result from factor-neutral technological change.

A rise in agricultural productivity combined with the corn price decline generates substantial increases in real income for all household groups using either of the two models (fifth and sixth columns of Table of Results). Total income gains are substantially greater in both real and nominal terms than under the PROCAMPO experiment. In the scenario where staples are tradeable (Model 1), corn production declines, but this decline is one third smaller than without the productivity increase (18 percent, compared with 29 percent in Experiment 2). Higher marginal profitability leads households to reallocate resources into livestock production, which increases as much as 13 percent. The productivity increase reverses the decline in the shadow value of family labor resulting from the corn price decrease in Experiment 1. As a result, migration now decreases (by 2.8 percent) rather than increasing.

In the closed corn market scenario (last column of the Table of Results), increased marginal productivity in agricultural production raises the supply of corn (by 10.6 percent) while driving down the local corn price (by 5 percent). It also stimulates production of the agricultural tradeable (livestock), although by less than in Model 1, where the economy is not constrained to be self-sufficient in staples. These agricultural activities compete with nonagricultural production for nontradeable factors (family and hired labor). As a result, nonagricultural output falls by 3.4 percent, and the family wage increases (by 1.8 percent). The higher family wage results in a decrease in migration (by 4.6 percent). Total nominal income rises by 5.1 percent, and real income jumps 5.6 percent. All households gain in both nominal and real terms from the rise in agricultural productivity in both models.

Despite the contraction of nonagricultural production in the village, higher household incomes stimulate trade linkages on the consumption side. As a result, total village imports increase by 4.5 percent.

In short, the presence of village nontradeables creates income linkages and price effects that alter, both quantitatively and qualitatively, the impacts of productivity gains on local incomes and production. Income effects generally are larger and tend to magnify linkages between the village and the outside world in traded-goods markets. Nevertheless, nontradeables create inefficiencies in local and regional production, diverting scarce resources into the production of nontradeables in which the village may not enjoy a comparative advantage in regional markets. They also constrain the supply response of tradeables. This is illustrated by a smaller livestock supply response to the productivity increase and also by a larger negative impact on nonagricultural production in the closed corn market scenario (last column of the Table of Results).

[8]The choice of a 10 percent productivity increase can be taken as arbitrary, but it is not out of line with impacts of education and technological change on productivity in Mexico. For example, in an econometric study on rural productivity, education and migration of eight villages in Mexico, we found that, controling for participation in different households' activities, a one person increase in family members with more than nine years of education is significantly associated with a 13 percent increase in household income from staple production. This result can be explained by the fact that households with higher education are those more highly capitalized and more closely linked to outside markets (Taylor, J.E. and A. Yunez-Naude, in press).

SUMMARY AND CONCLUSIONS

The results of the impact analysis based on VGEM contrast with findings of other studies in some important respects. A Nationwide Computable General Equilibrium Model that includes migration (Robinson et al., 1991) estimates that NAFTA and, in particular, the drop of the price of corn will have a much higher increase in migration to the U.S.—around 40 percent as compared with our estimation of 1.3 percent from Model 1. The main reason for the difference is that, due to the diversified nature of small-farms activities, a drop in the price of corn translates into a much smaller decrease in total farm income. In other words, with our modeling approach we consider the options that small farms have in getting income from sources different from corn production (livestock, nonagricultural production and waged labor). In addition to this, our model captures subsistence staple producers with deficits of corn production that benefit from the drop of the price of corn.[9]

Another study, extensively used by the critics of NAFTA and agricultural liberalization, compares the U.S. price of corn with the costs (monetary and non-monetary) of producing this crop in Mexico by small farmers. Considering the result that the U.S. price is lower, the author of this research concludes that corn production in Mexico will tend to disappear and rural emigration will sharply increase (Calva, 1995). The problem with this analysis is that it is partial (Calva isolates the production of corn from other small farmers' activities and sources of income), uses wages to evaluate family labor costs, and implicitly assumes no transaction costs for small farmers.

Our findings based on a stylized VGEM applied to a typical village of small producers of corn and livestock leads to the conclusion that the effects of NAFTA and the liberalization of the producer price of corn on the domestic supply of this grain will be lower than the predicted effect of other studies. [10] In addition, small farmers' livestock production is likely to increase with these reforms.

However, these results do not mean that small-scale farm production is to be ignored in the design of Mexico's agricultural policies. In a sense, this has been the official position in Mexico. It is reflected by the fact that PROCAMPO is based on income subsidies to all farmers producing staples, as well as by the separation the last two Administrations have done between their agricultural economic policies from their poverty alleviation policies.[11] By contrast, our model results show that using scarce public resources to enhance agricultural productivity in villages of small-scale staple and livestock producers can increase their households' incomes, reduce rural emigration and increase rural demand for manufactured goods. In addition, this type of policy may enhance the rural non-farm economy, a process that

[9] Another difference is that a micro economy-wide model compared with a national CGE model needs fewer assumptions to estimate and calibrate the model, given the availability of household-farm survey data.

[10] De Janvry et al. obtain similar conclusions using a different modeling approach and data.

[11] I am refering to the current Administration policy called PRODUCE, which is basically directed to subsidize only those farmers with competitive potential, and to SOLIDARIDAD, the poverty alleviation program initiated by President Salinas de Gortari which is separated, formally and administratively from PROCAMPO and PRODUCE.

has accompanied the successful development processes of East Asian countries. Government targeted investments in rural education and infrastructure are also fundamental for the development of rural markets. The existence of these markets is a requirement for reducing transaction costs faced by small-scale farmers as well as for including the notion of competition into the analysis of the effects of policy reforms on small-scale farmers.

The suggestions of public investments directed to villages of small-scale producers do not contradict the purpose of harmonizing North American agricultural policies, if we take that to mean the elimination in Canada, Mexico and the United States of prevailing subsidies to (modern) agricultural producers and government direct intervention in agriculture.

In fact, our discussion leads to the conclusion that economic harmonization between Mexico and its North American partners' corn and livestock sectors is not going to happen soon or even in the medium run.

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SERFIN

Salomón Salcedo-Baca

Today, we heard three very different papers on the Mexican Grain/Livestock Subsector, but they complement each other very well. Avalos' paper gave us a general overview of the grain and animal feed subsectors in Mexico. It is worth noting how heterogeneous grain production is in Mexico, as shown by the extremely wide range of profitability levels. Depending on location, the production system utilized, yields, and other factors, there are farmers with negative rates of return on investment while others experience rates of return as high as 95 percent.

One of the key issues that should be emphasized when the Mexican agricultural sector is analyzed is that each region and each production system responds very differently to market changes, to the North American Free Trade Agreement (NAFTA), and to agricultural and macroeconomic policy changes. This fact underscores the need for studies that follow a micro or village approach such as the one presented by Yunez.

Avalos. I am not as optimistic as Avalos with respect to future grain production in Mexico. She points out that profitability increased from 1994 to 1996 for most grains under the alternative production systems. Profitability did increase, indeed, but there were two short-term factors that were present in 1996 that are no longer in place: high international prices and an undervalued exchange rate. Grain prices are considerably lower now and the exchange rate is no longer undervalued. In 1996, we estimated that the exchange rate was undervalued by 9.1 percent; whereas, by 1998, we estimated an overvaluation of 5.7 percent. Thus, profitability in grain production during 1997 and 1998 has decreased compared to that in 1996.

Farmers have approached the government to seek additional support and the government, in some cases, has responded with marketing payment programs. Agricultural policy is another area about which I am not very optimistic. With the exception of PROCAMPO payments, there are no long-term policies to help producers face unfavorable market conditions. When international prices are low, farmers have to do intensive lobbying with the government to get assistance; they hold demonstrations and, sometimes, even block highways and major urban thoroughfares. This is a very time consuming and costly process for farmers and society as a whole, but it is played out again and again. Farmers complain about the uncertainty they face every year. This will probably discourage grain production in the future.

Avalos states there are some agricultural policies that, according to the Mexican Ministry of Agriculture, have increased corn production, such as the mechanization program and the "kilo per kilo" program. I have no doubt that these are policies that have helped some producers, but they are far from being important policy tools to assure a steady increase in grain production. Also, the increase in corn production in 1996 probably resulted more from higher price expectations than from these policies.

The last point I would like to make about Avalos' paper refers to her regression analysis on corn imports with respect to animal feed production. She did not find a strong link between imports of whole maize and domestic feed production. That probably had to do with the year of 1996, a crisis year for the livestock industry and a year when the Mexican government decided to increase by more than 100 percent the duty-free corn import quota under NAFTA. Import tariffs for grains from non-NAFTA countries were also reduced. Since domestic corn production was at a record high that year, the increased imports created several marketing problems and farmers received a lower price for their product. This discretionary policy with regard to corn import quotas is a very sensitive issue and it has created extreme discontent among farmers. Again, discretionary management of import quotas may become a discouraging factor in Mexican grain production.

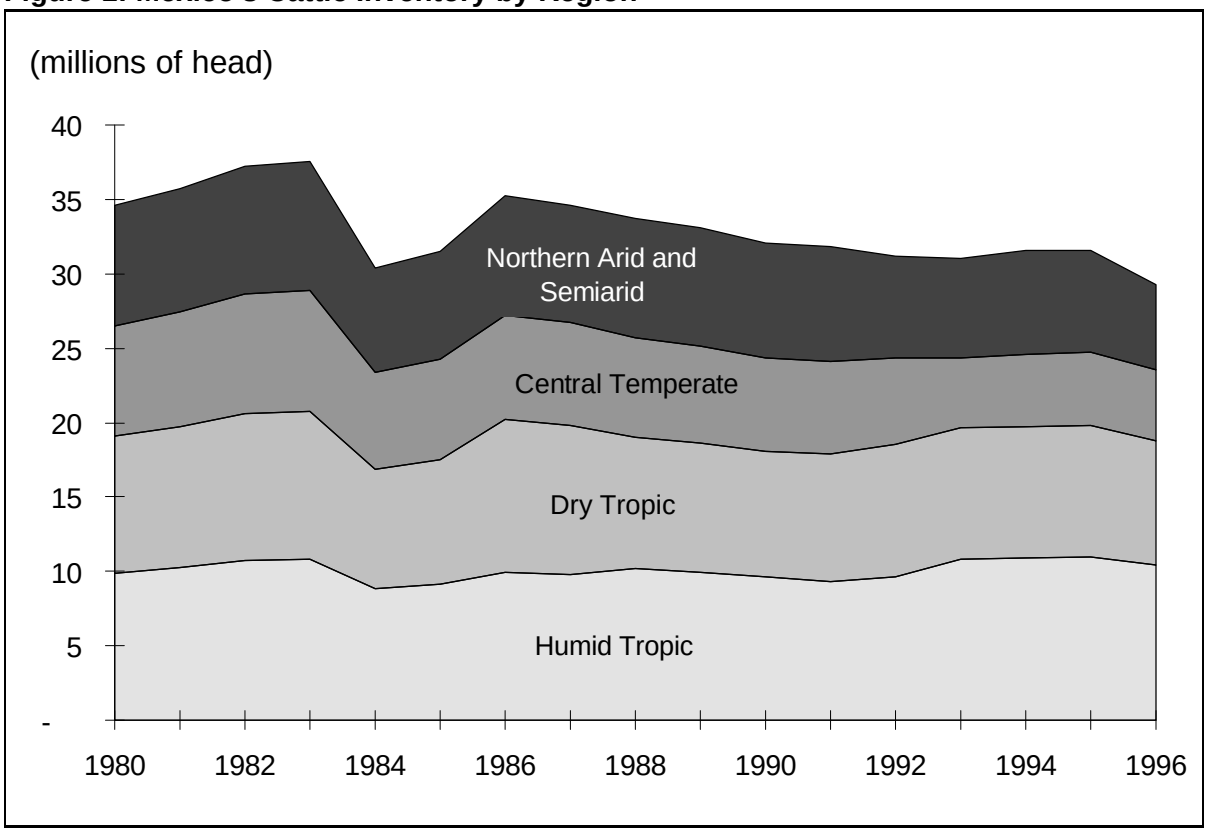
Aceves and Lopez. The Aceves and Lopez paper deals with the transition process that Mexican agriculture has undergone. It makes the important point that a completely new environment exists today for Mexican agriculture: one that is more market-oriented, with less government participation and globally integrated. It is worth noting, however, that all these changes were carried out at a very fast pace, leaving many farmers behind.

Perhaps the Mexican government has not been very successful at implementing transition strategies for farmers that help them adapt to a more open economy. The heterogeneous agricultural sector calls for differentiated policies. However, agricultural policies seem to be the same for all producers. For example, under PROCAMPO all producers receive the same payment per hectare regardless of what they produce, their location, yields, etc. They may even switch from grains to the production of vegetables or livestock and still receive this payment. To me, a direct payment to a tomato grower who is also an exporter, for example, doesn't make much sense. In contrast, even in the United States where agriculture could be regarded as more homogeneous than in Mexico, the Federal Agriculture Improvement and Reform Act of 1996 (FAIR) considers different direct payments for farmers depending on the product on which they have acreage base.

Aceves and Lopez also discuss livestock production in Mexico and the changes this subsector has recently faced. Indeed, during the past three years, the Mexican livestock sector experienced one of the worst crisis in decades. The sharp rise in international grain prices, which almost doubled production costs, was coupled with a dramatic fall in the demand for meat as a result of the 1995 Mexican economic crisis and a severe three-year drought. Although these three factors

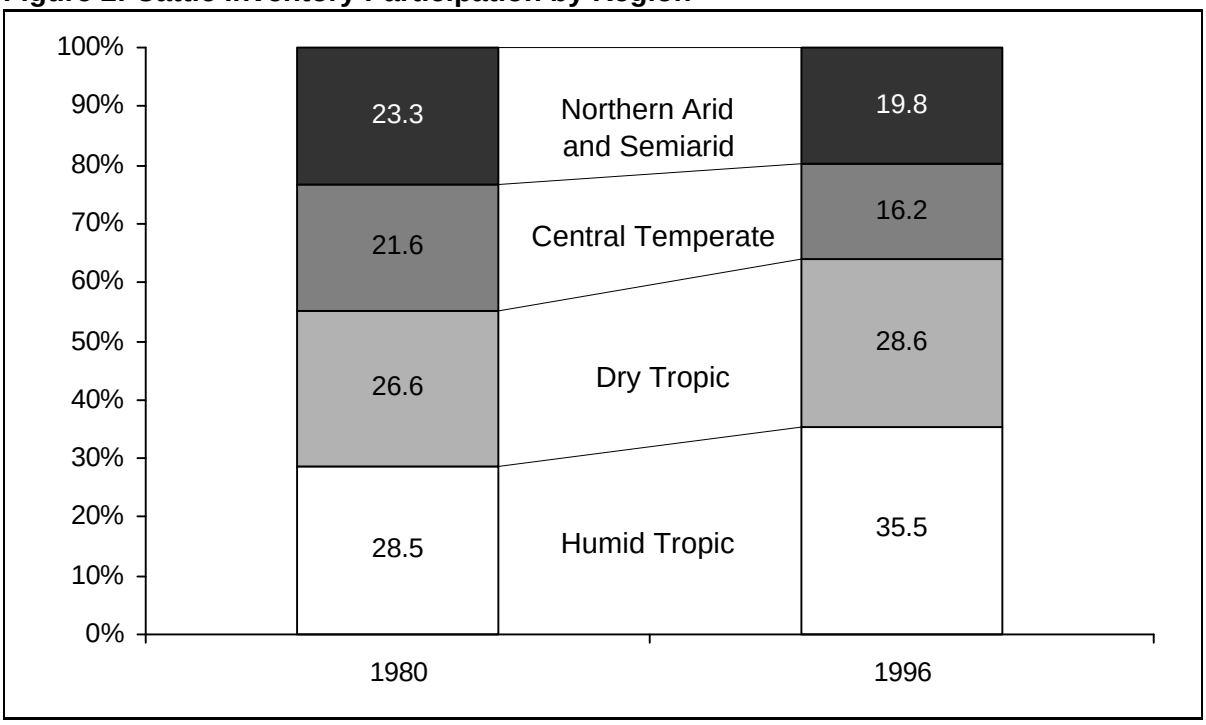
contributed to generalized losses in the sector, their impact varied depending on the region and the production system involved. Aceves and Lopez point out that cattle are produced in all 32 Mexican States, but there are 3 regions that share some specific characteristics—the arid and semiarid north, the Central Temperate Region, and both the dry and humid tropical areas of the country (Figures 1 and 2). When analyzing future livestock production in Mexico, it is essential to consider the sector's heterogeneity.

Figure 1: Mexico's Cattle Inventory by Region



Source: Secretaría de Agricultura, Ganadería y Desarrollo Rural

Figure 2: Cattle Inventory Participation by Region



Source: Secretaría de Agricultura, Ganadería y Desarrollo Rural

Cow-calf operations predominate in the Northern Arid and Semiarid Region. The main product is young cattle for export to the United States. Feedlot operations similar to those in the United States, using a high percentage of grains in the feed rations, are also found in this region. This production system is the most vulnerable to changes in the grain sector. In past years, as import tariffs for beef were eliminated and, recently, as the demand for beef fell and production costs skyrocketed, a great number of feedlots went out of business. It is clear that a concentration of production has occurred in the northern region.

The Central Temperate Region is the most important dairy production region in the country, but it has the smallest cattle inventory (16.2 percent of the total). Cow-calf operations market their product in three different markets—the extensive cattle production operations in the tropical regions; the export market (depending on price and quality considerations); and local feedlot operations that serve both the local and Mexico City markets. Feedlot operations are not as efficient as those in the north, and are also quite vulnerable to grain market changes.

Production systems in the Tropics Region are quite heterogeneous, although beef and dual-purpose (dairy-beef) operations predominate. Both regions comprise 64 percent of the total cattle inventory and supply most of the beef for the domestic market in Mexico City. Some cow-calf operations export calves to the United States. Production costs are quite low since most cattle are raised exclusively on grass. In the

Dry Tropic Region, crop residues and grains are used to sustain production in the dry season. Production systems in these regions are the least vulnerable to grain market changes.

Cattle numbers increased annually throughout the 1970s, but during the 1980s and 1990s they have steadily fallen. Three main factors lie behind this downward trend which include—a fall in per capita income, beef trade liberalization, and (in contrast to the arguments raised by Aceves and Lopez) reduced access to grains which is explained by insufficient domestic grain production, and the existence of import tariffs and permits.

The cattle inventory in 1996 (29.3 million head) was 15 percent lower than that in 1980. However, it is worth noting that each region shows a different pattern. Thus, while cattle inventory fell by 36.5 percent in the Central Temperate Region from 1980 to 1996, it grew by 5.5 percent in the Humid Tropic Region. Livestock production operations in the Tropics have been more successful at offsetting adverse effects (both macroeconomic and industry changes) while cow-calf and feedlot operations in the northern and central regions have been very adversely affected by them. Thus, while in 1980 the Northern Arid and Semiarid Region comprised 23.3 percent of the total cattle inventory, by 1986 its share dropped to 19.8 percent. The Central Temperate Region's share also decreased from 21.6 percent to 16.2 percent. In contrast, the Humid Tropic's participation in total cattle inventory jumped from 28.5 percent to 35.5 percent.

What is the future for livestock production in Mexico? Again, just as in the case of the grain subsector, it will depend on the system of production and on Mexican agricultural policy, which is not yet well defined. As for 1998, we made some profitability estimates for the three livestock regions. In the case of cow-calf operations, the return on investment in the Arid and Semiarid Region was 68.8 percent; 42 percent in the Temperate Region; and 90.4 percent in the Tropics Region. With respect to feedlot operations, the return on investment in the Arid Region was 26.4 percent; 19.1 percent in the Temperate Region and 36 percent in the Tropics Region (financial costs are not included). These figures suggest, in line with Aceves' and Lopez' findings, that livestock production is more profitable in the Tropics Region than in the other two regions. If the concentration process continues as well as a greater integration between the United States and Mexican livestock sectors, it is likely that livestock production will continue its downward trend in the Northern and Temperate Regions whereas it could experience a boom in the tropics region.

It is worth noting that, in the Tropics Region, livestock operations are still far from reaching a technological frontier. Thus, with investment and proper technology adoption, livestock production in this region may become extremely competitive.

Yunez. I found Yunez' paper extremely interesting and helpful for policy-makers. Because Mexican agriculture is very heterogeneous, this is the kind of research that I believe would need to be replicated many times. Yunez points out that one of the

reasons why research like this is rarely conducted in Mexico is because of a lack of information. The Mexican Ministry of Agriculture should consider investing more resources in the agricultural information system, so more quality research could be carried out and better policy decisions could be made.

I was surprised to read that a drop in the price of corn could have such positive impacts in rural villages. One would believe the opposite. This again shows how complex Mexican agriculture is. Also, the linkages between the village and the urban economy were worth noting—a linkage we often forget when analyzing the Mexican agricultural economy.

Yunez' findings with respect to his third experiment were extremely interesting and I believe they hold important policy implications. He found that by "allocating fiscal savings from corn price liberalization to public investments designed to raise productivity.," substantial increases in rural real income would be generated. Income gains would be greater than under the PROCAMPO policy. This finding questions the relevance of PROCAMPO, a policy that, as mentioned earlier, may not be the best suited for the heterogeneous Mexican agricultural sector. The design of differentiated policies to help farmers in the transition towards a more market-oriented and open economy is probably the main challenge facing Mexican policy-makers.

I believe agricultural integration among NAFTA members is a fact. There will be winners and losers. In Mexico, there is a great potential for becoming winners in several regions and systems of production. However, that may not be the case if proper agricultural policies are not in place.

Section 3

Transportation

The objective of this section is to identify constraints and conflicts as a basis for achieving harmonized transportation capability. Transportation is the vehicle of increased trade.

FUTURE TRANSPORTATION DEVELOPMENTS IN THE U.S./CANADA/MEXICO GRAINS-LIVESTOCK SUBSECTOR UNDER NAFTA AND WTO

Barry E. Prentice and William W. Wilson

INTRODUCTION

North American grain and livestock subsectors are becoming more integrated as barriers to trade are eliminated under the North American Free Trade Agreement (NAFTA) and the World Trade Organization (WTO). Increased trade creates a demand for further economic harmonization and focuses attention on the obstacles that remain. Transportation stands out as one of these anomalies. Customs and immigration legislation, and regulatory regimes of each country continue to impede the transportation of agricultural products.

Cross-border transportation services for grain and livestock operate in separate markets. Live animals and livestock products are carried almost exclusively by truck transport in specialized trailers that do not generally carry grain. Refrigerated meat products form the largest value and most geographically dispersed volume of NAFTA livestock product trade. Live cattle and hogs are trucked across borders for slaughter, as replacements in feeder operations, and for breeding purposes. Live animal moves are more concentrated geographically and volumes vary significantly over time. Truck movements of livestock are generally unobstructed except by health inspection and safety regulations.

The transportation of grain among the NAFTA countries is less integrated than the trade of livestock and meat products. Truck, rail and marine carriers compete intensely for domestic grain movements, but Canadian and U.S. carriers only compete indirectly in the origination of grain shipments for third countries. The lack of transborder competition for grain transport is a result of differing agricultural policy instruments and approaches to commodity marketing.

This paper examines the status of agricultural transportation among the NAFTA countries, and provides an outlook on future developments. The analysis begins with an overview of the macro changes affecting transportation in the NAFTA countries. This includes such issues as privatization / mergers, deregulation and the cancellation of subsidy programs. Subsequently, the focus turns to commodity movements and progress made to integrate and harmonize grain and livestock trade. The impact of remaining regulations and policy differences are highlighted. The paper concludes with thoughts on transportation and economic harmonization of the grain and livestock sectors.

MACROECONOMIC SETTING

Institutional barriers make it difficult for the transport sector to orient its traditional east / west operations to the new north / south trade flows. Transportation services were not included in the Canada-U.S. Trade Agreement (CUSTA, 1988). The U.S. government cited national security reasons to exclude its marine sector from the negotiations. The Canadian government demanded an "all-or-nothing" treatment of the transportation sector. At the time, the exclusion of the transportation sector was considered offset by the economic deregulation of the domestic transport industries that was occurring simultaneously.

Extension of CUSTA to include Mexico (NAFTA, 1994) did little to create freer trade for transport services. In the main, NAFTA served only to bring Mexican treatment of cross-border transportation to the equivalent procedures practiced between the United States and Canada. A schedule was developed that permitted reciprocal entry of trucking to the border states, and subsequently to all states after seven years. In addition, the Land Transportation Standards Subcommittee (LTSS) was established to pursue more compatible standards and regulations for rail and highway transportation within the NAFTA partnership.

The overall objective of LTSS is the elimination of barriers in trade and facilitation of cross-border movement of goods and services. Under the umbrella of LTSS, specialized working groups were formed to review the state of standards and regulations in a range of areas, including driver and vehicle licensing, vehicle manufacturing standards, transportation of dangerous goods and safety. The LTSS has agreed to: a legal age for operating a vehicle in international commerce; a common log book for hours of service; bi-national agreements on medical standards; steps toward harmonized regulations on hazardous materials transportation; and a comparison of vehicle weights and dimensions. Notwithstanding these advances, land transport between Mexico and its NAFTA partners has yet to live up to either the letter, or the spirit of the accord. By now Mexican trucks should have free access to all U.S. border states, but technical barriers (e.g., licencing) continue to block their passage.

The U.S. Intermodal Surface Efficiency Act of 1991 (ISTEA) set aside funds to establish north/south trade corridor routes. Several proposed routes have been named high priority highways under the *National Highway System Designation Act* of 1995. Reauthorization of the ISTEA legislation under TEA-21 is expected to yield "Intelligent Highways" technology and infrastructure improvements for border gateways.

Canadian and Mexican governments have pursued transportation policies that complemented the competitive U.S. industry. Since 1995, the Canadian government has privatized the Canadian National Railway, liberalized rail regulations (*Canada Transportation Act*), and eliminated the $600 million annual transportation subsidy for grain movements under the former *Western Grain Transportation Act* (WGTA). Further Bill C-4, an act to amend the *Canada Wheat Board Act*, could have implications for transportation.

After more than 70 years of government ownership, the Ferrocarriles Nacionales de Mexico (FNM) was divided into concessions that are being sold. In 1997, the Laredo-Mexico City rail link, known as the Northeastern rail concession, was purchased in a joint venture between the Kansas City Southern and TMM, which is the largest marine transportation company in Mexico.

The Class I railways have responded to the new environment of NAFTA with mergers that provided north/south linkages. CN has announced plans to merge with the Illinois Central that will expand its reach to six key ports and make the CN-IC the fifth largest railway of NAFTA. The CN-IC can provide single line services that avoid switching costs and delays between most major points in Midwest U.S. markets and Canada. In April 1998, the CN-IC announced a marketing agreement with the Kansas City Southern Railroad that enables single line movement from Canada to Mexico.

The U.S. railways have undertaken mergers to expand their north/south networks. The Burlington Northern-Santa Fe merger and the Union Pacific-Southern Pacific mergers have created giant railways that span the entire United States west of the Mississippi River. Although the railways have experienced some "indigestion" in these mergers, such as the recent embargo of the UP-SP at Laredo, the network economies should ultimately give shippers improved rates and service. The Mexican border embargo also points out the problem of capacity constraints at key transshipment points that limit traffic growth, at least in the short-run.

The transport sector is challenged to serve a rapidly evolving agricultural customer and to address the technological changes that are revolutionizing global trade. Genetic engineering is providing a plethora of grain varieties and promises to give processors the ability to tailor their inputs precisely. As more buyers seek "Identity Preserved Grains," the bulk handling system is confronted with the threat of more congestion. The rapid growth of intermodal rail service may relieve the pressure on the bulk handling system for specialty grains. Containers also offer opportunities to ship grain over transborder routes where institutional barriers preclude bulk movements.

Producers have been reacting to changing grain transportation costs and falling price supports. Greater investment in the red meat industry has been matched with record exports of pork and beef. North American farmers are becoming more interested in the development of value-added processing. The desire to improve value-added content has lead to an explosion of "new age" cooperatives in the northern United States and similar investment in food processing on the Canadian prairies. As a result, the trucking industry has now displaced rail in the movement of U.S. grain (Milling & Baking News, 1998). No doubt, this trend will lead to greater demand for cross-border trucking of grain, too.

REGULATORY BARRIERS TO TRADE

Barriers to agricultural trade posed by transportation comprise "natural" obstacles and "man-made" hindrances. Natural obstacles are the logistical costs associated with the equipment, labour and fuel necessary to move goods from origin to destination. Man-made hindrances are the government programs and regulations that limit the ownership and operation of foreign vehicles, or discriminate in favour of domestic carriers. Despite NAFTA, each country continues to operate under differing regulatory regimes that have evolved through domestic pressures. Salient features of regulatory barriers are described below and subsequently, implications of these differences are discussed.

Motor Vehicle Weights and Dimensions Regulations

Incompatible vehicle-weight limits are the most important impediments to north/south long-haul trucking. Weight limit regulations vary by province and state along all routes between Canada and Mexico. Iowa and Missouri have the most restrictive regulations, at 36,387 kilograms (kgs) maximum gross vehicle weight (GVW) for tractor semi-trailer configurations. Mexico has the most liberal weight limits (48,500 kgs), but where no effective enforcement exists observed weights are much higher. Western Canada is the next most liberal truck weight limit at 46,560 kgs GVW. A list of north/south weight regulations is presented in Table 1 for the Mid-Continent International Trade Corridor (MITC) that follows the I-29/I-35 highway route from Winnipeg to Mexico City.

Table 1: Mid-Continent International Trade Corridor Volatile Weights and Configurations

Highway Routing	Weight Limits		Configurations		
	Tractor Semi-Trucks (KGS)	Double Trailer (KGS)	Rocky Mountain Double	Turn-Pike Double	Combo Trailer Triple
75 Manitoba	46,560	62,500	X	X	X
I-29 North Dakota	36,287	47855	X	X	X
I-29 South Dakota	36,287	56,700	X	X	X
I-26 Iowa	36,287				
I-29/I-35 Missouri	36,287				
I-35 Kansas	38,783	38,783	X	X	
I-35 Oklahoma	40,824	40,824	X	X	
I-35 Texas	36,287				
85 Mexico	48,500	66,500	X	X	
54 Mexico	48,500	66,500	X	X	

Source: Compiled by Authors.

Besides differences in weight limits, the various jurisdictions may have incompatible regulations regarding truck configurations. Usually, the northern U.S. states permit heavier vehicles, while the southern U.S. states allow higher cube trailers. Very heavy trucks are permitted in Western Canada, but lighter U.S. trucks may not necessarily enter. Though these trucks may meet all the height, weight, and length regulations, depending on where the axles are positioned, or whether they have a lift axle, U.S. trucks may be prohibited (or be required to purchase a "special permit") (Prentice,1997).

Differences in truck weights and dimensions pose a great problem for coordinating movements. For example three jurisdictions do not permit double trailer combinations. Canadian carriers who serve the transborder market must have separate fleets of trucks that meet the 80,000 pounds, eighteen wheel, standard vehicle for U.S. movements. Mexican carriers face other barriers including a debate over equipment safety standards and driver qualifications. Shippers bear a higher cost of underutilization than would exist if vehicle regulations were uniform at a higher gross vehicle weight.

Cabotage Restrictions

The right to operate foreign owned vehicles in a domestic market is known as cabotage. Customs regulations and immigration rules limit the freedoms of foreign transportation companies. Often these regulations are poorly understood by the carriers, and are inconsistently enforced. These rules can add to operational costs and getting caught breaking the rules can incur a $5,000 penalty for a first offence. As a result, most carriers do not attempt to compete for loads that involve solely foreign origins and destinations. The motor carriers are plagued with empty moves when foreign freight could be carried. The railways are less affected by cabotage, but are not immune. Crews, and at times locomotives, are forced to change at border locations that may be inconvenient and costly.

U.S. and Canadian customs and immigration policies for transport have had significant differences. For the motor carrier industry, Canadian customs rules permitted empty trailers to be repositioned by any driver after a full trailer was delivered. U.S. rules required that same drivers reposition the empty trailer who had originally delivered it. Other differences exist in the pickup of an incidental load as part of an international movement. Canadian rules generally allow more flexibility for foreign carriers than the U.S. regulations.

After three years of discussions, the U.S. Customs Service has recently changed its interpretation of cabotage. Previously, Customs looked at the transportation routes involved to determine whether a movement was international in character, or an illegal domestic "point-to-point" violation. As of December 1, 1997, U.S. Customs revoked prior interpretations and now consider the nature of the merchandise carried to decide whether the shipment is international or not.

Access to international merchandise does not create an opportunity for Canadian truckers to carry other U.S. domestic merchandise. The entire load must be international to be legal in the United States. Customs has clarified its rule regarding the transfer of empty trailers. The new ruling allows switching of empty trailers between points in the United States.

According to the new rules, Canadian-based equipment can be used to transport goods between U.S. points if the goods are international—that is, the load either originated from or is destined for a point outside the U.S. Previously, Canadians were not permitted to pick up Mexican goods on the U.S. side of the border destined for, say, Chicago. Although the U.S. Customs' interpretation has changed, U.S. Immigration has not made the appropriate corresponding changes to regulations affecting Canadian drivers. The use of Canadian-based equipment would be lawful under the new U.S. Customs interpretation of cabotage, but the use of the driver to make the same movement would be illegal under Immigration laws (Smyrlis and Smith, 1998). Informal assurances have been given that the two U.S. agencies would enforce the regulations the same way, but no formal announcement from U.S. Immigration has been made, and none is expected.

Despite Canadian and U.S. success in harmonizing Customs regulations, Immigration rules may be getting more divergent. In 1996, the *Illegal Immigration Reform and Immigrant Responsibility Act* (IIRIR) was passed by the U.S. Congress. Section 110 of IIRIR would require documentation of the entry and departure of every alien crossing the U.S. borders. Implementation of visa requirements for Canadians has been delayed, but not abandoned. Concern exists that Section 110 would create delays in trade that adds to inventory, processing and freight costs. At busy border crossings, like Windsor-Detroit, considerable investments would be required to accommodate expanded facilities and automate processes to achieve the current flow of traffic.

RAIL REGULATIONS ON RATES AND SERVICE

Both Canada and the United States are experiencing the effects of regulatory changes in the rail sector, albeit the dynamics differ. These effects are particularly important in the grains sector in which rail plays an important role in shipping. The process of deregulation in the United States began in the early 1980s, whereas in the Canadian grain sector it is really just beginning. The major features of the regulatory system in each country are discussed briefly. Those of the United States are emphasized because these are referenced as a benchmark for changes in Canada.

United States

Many changes that occurred in the U.S. grain marketing system were concurrent with the Staggers Rail Act (SRA) of 1980. The SRA introduced important regulatory changes in overall rate levels. Effects on the grain shipping and handling industry are discussed below along with, where appropriate, the pre-SRA institutional environment.

Rate Regulation: Captive Shippers, Market Dominance and the SRA. The SRA imposes two tests that must be met before the ICC (now the STB)[1] has jurisdiction to regulate rate levels. The first is a threshold level of revenue to variable cost ratio (R/VC)[2]. Specifically, if the R/VC exceeds the threshold, the STB may have jurisdiction to regulate rates in that movement.

The shipper is not necessarily captive simply because the R/VC exceeds the threshold. The second test is a finding of *market dominance* in the relevant market. This is defined as "an absence of effective competition from other carriers or modes of transportation for the transportation to which a rate applies" (49 § U.S.Gc. 10701a[b]1) (Supp.IV 1980). It is intended to be a test or screening device for rate reasonableness. Guidelines have evolved to allow for evidence of direct competition including inter and intramodal, as well as two forms of indirect competition, product and geographic. These are more than administrative criteria and are evaluated in the

[1]These roles and functions have since been replaced by the Surface Transportation Board (STB).
[2]In 1984 that threshold was 1.80 but it now depends on the extent the railroad is earning an adequate return.

context of competitive markets considering inter and intramodal, as well as product and geographic effects. If the carrier is found to be market dominant, the shippers could be defined as "captive" and then the STB would have jurisdiction to regulate the rate.

Rate reasonableness is evaluated on a case by case basis. There have been few cases in which rate levels have been appealed under these criteria. Most notable and relevant here is the McCarthy Farms shipping case[3]. Briefly, that case has had several rulings since it was originally filed in 1978. In 1987, the ICC ruled that the Burlington Northern was dominant in wheat and barley shipments to the Pacific Northwest and that the shippers were captive. However, the most recent ruling (August 14, 1997) indicated these contested rates were not unreasonable and did not exceed the maximum reasonable level. This decision was based on the constrained market approach and stand alone costing procedures.

Rate Changes Were Liberalized. Prior to 1980, rate changes required 90 days notice for increases and there were fairly liberal procedures to challenge proposed changes. The net effect of this was that rates were largely very rigid and changes were introduced only infrequently. Proposed changes were typically subject to a very long notice about the rate increase. As a result shippers had little risk related to rate changes.

The SRA changed the dynamics of rate changes. Specifically, rate increases (decreases) required a 20(1) day notice. The effect of this was to allow greater flexibility for railroads to respond to market conditions, but also increased the exposure to increases in rail rates for shippers.

Contracts. Contract shipments were an important feature of the service environment during the 1980s. In addition, some evolving contract terms likely influenced the pricing and car allocation practices that subsequently evolved.

Contract rates were widely used in the Untied Sates in the first years following the SRA. The SRA explicitly encouraged carriers and shippers to enter into confidential contracts for grain shipments subject to informational disclosure[4]. Shippers could challenge contract rates on grounds of competitive harm or impairment of common carrier obligation. In addition, the SRA allowed agricultural shippers to challenge contract rates on grounds of the carrier's refusal to offer similar terms to them (which would constitute unreasonable discrimination). The legal process to intervene required that the complainant must first prove they would prevail and that the dispute cannot be resolved otherwise.

[3]See Surface Transportation Board Decision No. 37809, August 14, 1997: *McCarthy Farms v. Burlington N.R.R.*

[4]Summary information about contract terms were filed by the carrier with the ICC. This information was fairly general and was publicly disseminated including information about railroad, commodity, general origins and destinations, number of cars, type of movement, base tariff rate, any special features and the minimum annual volume.

Premium Rates for Premium Service. An important feature of the SRA was a clause to allow railroads to charge premium rates for premium service. Specifically, Congress stated that "rail carriers shall be permitted to establish tariffs containing premium charges for special services of specific levels of services not provided in any tariff otherwise applicable to the movement" (Section 10734 of Title 49, United States Code). As a result of this provision, railroads actively pursued market-driven allocation mechanisms, besides addressing shippers complaints of car availability and to foster productively gains. This was important because the clause facilitated development of more elaborate guaranteed forward shipping mechanisms and service competition (see below).

Before the mid 1980s, tariffs did not contain service options or alternatives for car allocation. Railcar allocation was generally established on a "first-order-first-serve" basis. Uncertainties in railcar availability and lack of penalties for car cancellations encouraged persistently over ordering and a phenomenon known as "phantom orders" (Wilson, 1989). The SRA facilitated development of this mechanism by allowing (and encouraging) charging of premium rates for premium services, and by allowing a portion of shipments under bilateral contracts. The BN was the innovator in developing of these mechanisms which have now been developed by virtually all of the U.S. Class I railroads.[5]

Each railroads' car allocation system has evolved toward a system comprising multiple mechanisms. Generally, these include a mechanism for allocating cars for general tariff service, one with a shorter-term guarantee and one with a longer-term guarantee and bilateral equipment obligations. Each of these is characterized generally below:

- General Tariff allocation methods have been redesigned to assure access and to discourage persistently over ordering and eliminate the need for shippers to be first in line. Carriers have taken two approaches to accomplish this: 1) random selection and 2) penalizing cancellations.
- Short-term Guarantee programs (e.g., COTs, PERX) reward forward logistical planning. Common features of these programs include forward order period, shipper bidding process, transferability, shipper cancellation penalties, and carrier performance guarantees.
- Long-term Guarantee programs promote greater efficiency by placing the management of private railcar fleets in the hands of rail carriers. Carriers can expand fleet size while offering logistically differentiated services to shipping customers. In addition, Long-term Guarantee programs provide incentives to level shipping patterns and extreme seasonal swings in grain movements (Priewe and Wilson, 1997). Shippers receive guaranteed services, and rail carriers benefit from more consistent shipments. In addition, this program implies a risk sharing between shippers and carriers in expanding

[5]Wilson and Priewe (1997) provide a comprehensive description of the development of these mechanisms.

car fleets and railcar efficiency (cycle times). Transferability is also an important element of Long-term Guarantees since most programs rely on participation from larger grain companies to facilitate these instruments through secondary markets.

The important features of these systems from a grain shipper perspective are that: 1) multiple mechanisms are allowed for shippers to choose from; 2) forward shipping options are offered; and 3) differing degrees of guarantees are provided by the carrier. None of these options were available before deregulation. These systems have already had very important implications for the evolution of grain marketing and the railroad industry (see Priewe and Wilson (1997) for a summary of implications of these mechanisms on grain shippers).

Rail Incentive Mechanisms. The evolution of the rail incentive mechanisms has been very crucial to the changes that have occurred in the grain handling and transportation industry. Differentials implied in these mechanisms reflect economies of rail operations and are passed on as rate discounts. In the process these rate discounts provide incentives to induce more efficient grain handling and shipping practices.

The grain rate structure has evolved to include trainload, single and multiple-origin rates, and programs to enhance efficiencies in the total movement—commonly called origin-destination efficiency programs. Each of these are very important features that affect rate spreads, providing differentiation and incentives among rail service levels. It is important that these are not necessarily an outgrowth of the SRA, and in fact could have been and in some cases were introduced prior to the SRA. Generally, these include: 1) origin efficiency, or, trainload rates; 2) origin-destination efficiency programs; 3) per car rates; and 4) rates and requirements for shipments in higher-cube (286,000 lb.) covered hopper cars.[6]

Effects of Deregulation on Rail Rates. While rate increases have been a major concern for shippers, most of these have been unfounded. In fact, several studies have indicated that because of deregulation, cost savings have accrued and rail rates have fallen in real terms. Wilson (1997, p. 23) found that "the effects of deregulation on costs and productivity gains are tremendous with costs in 1989 estimated to be 40 percent lower under partial deregulation than they would be under a regulated regime." In a related study focused on rail pricing, Wilson (1994, p. 20) found that though there were some initial increases in rates following deregulation (1980), by 1988 "deregulation produced lower prices in most commodity classifications and did not increase prices in other classifications, suggesting that advances on productivity have dominated any adverse market power effects."

[6]Details of these mechanisms, as well as their evolution over time are described in Wilson (forthcoming). There are numerous forms of rate discounts that evolved in the U.S. rail system. It is critical that any comparison of rates over time, as well as between U.S. and Canadian regions account for the cumulative effects of these discounts.

Finally, even in some regions of the United States with relatively less station-to-station intramodal rail competition rail rates have decreased because of deregulation. In particular, Montana is a state in which rail rates are highly contested by shippers. However, since deregulation in 1980, the effective rail rate (from Great Falls to Portland) has increased from 71 to 86 U.S. c/bushel. In real terms, this has been an effective rate reduction of 31 percent. Another comparison is that the rail rate has declined by 31 percent, whereas the price of bread has increased by 15 percent. No doubt this is a highly contested area and a point of reference for change in Canada, but it is notable that these rates have declined due to major forces: productivity gains and intermarket competition.

Canada

A separate set of regulations affects grains for movement within the prairies. Changes in the WGTA increased rail shipping costs paid directly by shippers (previously, the total cost was comparable, but a portion was paid directly by the government of Canada to the railroads). It is important that the new higher rail rates (specifically, that portion paid by the shipper) are still substantially less than comparable rates in the United States. However, the legislation (*Canada Transportation Act*, Division VI *Transportation of Western Grain)* states specifically that these rates are for the movements of "any grain or crop included in Schedule II that is grown in the Western Division… (p. 70) for movements to Thunder Bay or Armstrong… and specifically excludes shipment to British Columbia ports for shipment to the United States."

The underlying legislation provides the formula for rate determination and describes its application. Specifically, it establishes a maximum rate scale. These rates are frozen to the year 1999 when they become subject to the CTA conditionally upon the results of an efficiency review, unless challenged otherwise.

Railcar allocation in Canada is highly administered based on past shipping practices. One important distinction is between the allocation of cars for shipment of Canadian Wheat Board (CWB) grains versus non-board commodities.[7],[8] CWB cars are allocated by the Board to its designated shippers and train runs (zones are being implemented) for the movements of CWB grains (Prentice and Campbell,1998). The other portion is allocated by the CAPG (Car Allocation Policy Group, a temporary mechanism to replace a previous regime called the Grain Transportation Authority) as non-board allocator, for the movement of non-board grains (i.e., for movements not controlled by the CWB). Normally, these are oats, canola, etc., but would also include any shipments of U.S. grains to or through the Canadian grain marketing system.

[7]This system is under dispute in Canada and is under pressure for change. For an extensive review of the evolution of car allocation in the United States, see Priewe and Wilson (1997).

[8]This is notwithstanding the potential implications of various forms of government-owned cars in Canada.

The regulatory regime governing rate levels and service for grain in Western Canada is very different, than for other commodities shipped by rail in Canada, or for grains shipped in Eastern Canada. For these commodities the CTA regulatory regime is more similar to that in the United States.

FUTURE ISSUES

As the agricultural sectors in the NAFTA countries become more integrated through the respective bilateral trade agreements, pressure will increase for commercial and policy harmonization of the facilitating functions. One of the more important ones is the transport sector.

Commercially, the grains sector of North America is becoming harmonized more rapidly than is the policy environment. The commercial integration will likely be a two-stage process. First, firms will become more integrated through asset ownership. As this is being done, the next stage will be pressure to standardize commercial practices across the geographic region. This is the stage that has yet to evolve. It is interesting that the commercial integration is leading, even though it would likely be more ideal if the policy environment was harmonized first. The commercial sector is leading the way toward integration which suggests that eventually business interests will provide added pressure to harmonize the policy differences.

The transport sectors in each country have evolved essentially independently of that in the neighbouring country, but are increasingly being forced to become more integrated. As this occurs, several important issues will emerge. These are described below briefly.

Rail Service and Car Allocation Systems

Railcar service problems, which stem from the underlying car allocation systems, have evolved differently in each country. The fundamental problems are similar on both sides of the border, but the approaches to resolve these conflicts are distinct.

Many changes in the grain shipping industry of the United States evolved in response to competitive pressures and to some provisions of the *Staggers Railroad Act* of 1980. Of particular interest has been the evolution of railcar allocation policies, rail service strategies and problems, and the heightened importance of transportation and logistics management for grain shippers (Gelston and Greene, 1994; Baumel and Van Der Kamp, 1996)[9]. Before 1980, few changes occurred in railcar allocation. Railroads had always been free to initiate service proposals under the general tariff system. However, regulatory procedures and rate bureaus stifled such innovation. Service proposals were subject to regional rate bureaus consisting primarily of carrier representatives.

[9]This has been a topic of growing concern. See Becker (1985), Harding (1995) and Kaufman (1994) for various views.

In the late 1980s, the U.S. railroads began the development of alternative car allocation procedures as a cumulative result of competitive pressures, shipper demands and some features of the SRA. Generally, the major features of these systems are 1) a multitude of mechanisms are offered shippers; 2) a portion of each carriers' fleet is reserved for tariff allocation; 3) alternatives are offered shippers for forward and guaranteed service; and 4) risk sharing alternatives between carriers and shippers are offered. During the last decade, virtually every Class I U.S. railroad has developed comparable systems encompassing these features.

These systems have not been without problems. Indeed the initial systems were challenged in a lengthy legal battle. In addition, there are ongoing concerns about the common carriage obligation under these systems, that some mechanisms remove cars from the fleet that would otherwise be available for tariff obligation, and that even guaranteed cars are sometimes not placed (though guaranteed payments are made from the carrier to the shipper) resulting in uncertainty for shippers.

Comparable transition is yet to unfold in Canada, but much of what is at issue in the current CTA case (CWB *vs* CN and CP) relates to service failures during 1996/97 and trying to define service obligation for shipping CWB grains. In addition, the *Federal Grain Review*, under Mr. Justice Estey, is scheduled to provide recommendations for change by the end of 1998.

As these systems unfold and are adopted, major issues are emerging in each country. In the United States this relates to the interpretation of *common carriage*, and in Canada it has been referred to as *service obligations*.[10]

Operational/Capacity Limits in the Pacific Ports

An apparent evolving US/Canada problem is that of the likely operating/capacity constraint in Canadian West Coast ports. This has exacerbated over time in response to changes in WGTA rates, growth in Asian economies, reduced shipments to Russia, etc., and worsened due to some operating practices at those ports. As these limits are reached, pressure increases to ship some marginal shipments through U.S. West Coast ports (1996/97) and U.S. Gulf. Indeed during the 1996/97 shipping problems, Canadian grain was shipped through the U.S. West Coast (though the costs were substantially greater), and experiment shipments were made through the U.S. Gulf by barge.

This capacity problem is also being challenged by the differentiated marketing strategy being pursued by export marketers. It is becoming increasingly apparent that the number of segregations in the Canadian marketing system has been increasing, as has that in the United States (but to a lesser extent). The effect of increased segregations on the logistics system constructed for more homogenous crops is for reduced efficiency and increased frequency of capacity constraints (Prentice, 1998).

[10]To emphasize, common carriage in the United States is alleged not to be meaningful under its current interpretation (NGFA, 1998).

Rail Regulatory Differences

Differences in the underlying regulatory mechanisms governing rail shipping is an issue that will likely become apparent in the future. In general, the U.S. treats grains the same as all other commodities and relies more on market pressures (intra and intermodal, as well as product and intermarket) to govern rate levels. Service levels (being reflected through rail car allocation systems) are generally governed by competitive pressures, and shipper demands. In contrast, railway freight rates for grain in Western Canada are fixed and service is highly administered. Generally, these rates are at levels less than those in the United States, and are highly rigid through time and with respect to geographic (distance-based) and temporal considerations.

The effect of these different approaches to regulation ultimately results in economic distortions, with pressure to converge, or, result in further intervention.

Reciprocal Access[11]

The establishment of handling facilities at U.S. border points with rail access makes cross-border shipping more efficient and attractive. These include the joint ventures between Alberta Pool and General Mills at Sweetgrass and the venture between Saskatchewan Wheat Pool and General Mills at Northgate. While some have initially promoted these as primarily for shipment from Canada to the United States, their strategic development has been to develop and facilitate trade in both directions, varying by commodity and depending on market conditions over time. These are likely natural logistical channels for shipping U.S. feed grains into Western Canada and potentially for shipping U.S. grains through Canada to export offshore.

A related change that has potential long-term implications is the expansion of export-handling capacity at Roberts Bank in southern British Columbia. This is notable because West Coast handling capacity in Southern Canada has been constrained which, in fact, is likely an important cause for the escalation of movements of Canadian grain to/through the United States. This constraint has also generally limited the ability of U.S. grains moving to/through Canada. In the future, this expansion could provide the needed capacity relief necessary to expand Canadian west coast exports.

Differences between the rail shipping systems in the two countries could affect future trade flows. Though Canadian rail rates have been increased, they are still less than those that apply from similar U.S. shipping points. These differences are particularly notable in the Northern tier regions or North Dakota and Montana.[12] If everything else is the same with equal access, this difference is important because it should induce some U.S. grain to move to or through the Canadian marketing system. Through this process, the potential for cross-border trade would provide competition

[11]See Wilson (1998) for a summary discussion of the motivation and issues surrounding reciprocal access.
[12]Fulton and Gray (1997) indicated that these differences are as much as $1/bushel.

to shipping regimes for U.S. grains. Currently, there is minimal movement of U.S. grains to/through Canada; however, in the future (with expansion of West Coast ports and more direct cross-border and bilateral linkages), the likelihood/frequency of U.S. grains moving to/through Canadian infrastructure will increase.

The Joint Commission indicated that a longer-term objective should be to provide reciprocal access over time (p. 95). One vision of the Joint Commission was that ultimately, pressures will escalate for greater integration between the marketing systems in Canada and the United States. The commercial process toward integration of these systems has escalated, which, in the future, will add to pressures to harmonize as much as possible marketing, and possibly policy, mechanisms. For these reasons, the term *reciprocal access* was promoted as a concept for discussion about changes to reduce trade frictions.[13]

Notwithstanding the trade barriers, reciprocal access should be viewed as a longer-term goal. One interpretation of reciprocal access is that growers would have reciprocal access to certain features of each country's marketing mechanisms and infrastructure. In a marketplace with greater reciprocal access, cross-border trade may occur due to differences in marketing costs. However, some important competitive functions of the marketing system in each country are denied cross-border participants.

As Canadian grain is exported to/through the United States, it has full nondiscriminatory access to comparable U.S. functions. The U.S. handling and shipping system generally has adequate capacity and is efficient enough to induce cross-border shipments. These are purely commercial and nondiscriminatory with respect to country of origin.

Potential benefits of the U.S. marketing system include access to transport infrastructure (rail, road infrastructure, barges and port infrastructure), elevators, and risk transfer through U.S. futures markets. While these are primarily a result of commercial relationships and mechanisms, the public sector is involved through providing infrastructure, services, and a regulatory framework. Canadian shippers are not treated differently when using the U.S. transportation system and generally have equal access to its capacity at nondiscriminatory rates. This would not be true for U.S. shipments through Canada. In addition, allocation of railcars in Canada for shipment of U.S. grains could affect the viability of trade flows to the extent that there are differences between CWB and non-CWB grains. This is in contrast to U.S. railroads that do not distinguish country of origin in allocation of cars, i.e., Canadian shippers have equal access to U.S. railcars through tariff and contractual allocation mechanisms.

[13]In trade discussions reported in January 1998, the United States suggested a pilot project to allow U.S. grain to be shipped to Canadian elevators. This is obviously an effort toward effectuating the possibility of reciprocal trade *(Western Producer).*

SUMMARY AND CONCLUSIONS

The transport of grain and livestock between Canada and the U.S. should be very straightforward. The infrastructure is compatible, business operations are similar and trade barriers have been falling under the Canada-U.S. and North American Free Trade Agreements. The problems that affect the transportation of grain and livestock are subtle in nature and are largely the unintended result of other domestic policy considerations.

Unlike other sectors of the economy, transportation services were essentially excluded in the negotiations of freer trade in North America. Pressure to incorporate the transportation sector into a comprehensive free trade agreement was diminished by the deregulation of the transport that was occurring simultaneously. Although deregulation created a more liberalized environment for transport, its shortcomings now stand out. Inconsistencies in vehicle weights and dimensions and restrictions on cabotage activity add to the cost of transborder movements.

Differences in trucking regulations affect Canadian shippers more than American shippers. Short moves to local transborder markets can generally be accommodated from either Canada or the United States. Longer movements to the southern half of the United States and Mexico are more difficult. U.S. cabotage restrictions reduce the opportunities for Canadian carriers to obtain return loads. Consequently they are less interested in serving these markets and/or demand freight premiums to offset the risk of an empty return.

The problem in rail transport is also asymmetrical. Canadian grain has open access to the U.S. transportation and handling system on a nondiscriminatory basis, while U.S. grain shippers are not given *reciprocal* access. U.S. grain can move through Canada, but these shipments are ineligible for the regulated freight rate. Moreover, the rail car allocation system in Canada discriminates on a country of origin basis.

The lack of harmonization in the transportation sector has direct and indirect impacts on the grain and livestock sectors. The direct impact is shipping costs that are higher because the transport sector has to operate around these regulatory differences. The indirect impact is the reduction in competition in the logistical channels. Reduced competition means that service and/or rates for transportation are less favourable to the grain and livestock sector than would be the case in a harmonized environment.

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AGRI INDUSTRIES

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The Prentice/Wilson paper provides an excellent overview of the current transportation environments in Canada, Mexico and the United States. Inconsistent policies between and within countries highlight the transportation discontinuities that must be overcome to provide a seamless transportation network for the North American Free Trade Agreement (NAFTA) trade flows. Clearly, the transportation industry is positioning itself to take advantage of potential traffic growth spawned by NAFTA. For example, the Canadian National Railway (CN) and Illinois Central (IC) recently announced an alliance with the Kansas City Southern Railroad (KCS). These three companies are trying to capture a portion of the 11 to 14 percent North-South freight growth which has been stimulated by NAFTA. Cross-border trade growth under NAFTA was also cited as a possible savior for the downtrodden barge industry and as a rationalization for the recently announced venture between American Commercial Lines (ACL) and the Vectura Group, Inc. (Mathews 1998).

Historically, the transportation industry has had trouble influencing policy-makers' decisions in favor of transportation. Past stigmas have haunted the transportation industry. Typically, truckers are associated with the Teamsters organizations, and railroads cannot seem to shake their monopolistic descriptions. For these reasons, lobbying efforts by the transportation industry are often viewed as self-serving and as an attempt to gain a competitive advantage relative to shippers and/or competing modes of transportation. Consequently, the transportation industry alone will have difficulty influencing the harmonization of policies governing cross border moves. To commercially put pressure on policymakers, carriers should attempt to enroll shippers to help push for a more seamless transportation network.

Agriculture is moving towards a systems approach for production where a system is defined as a vertically-coordinated supply chain from farm inputs to the retail end-user, either through ownership or contractual agreement. Evidence that systems are evolving include:

- Hormel, a well-known U.S. packer, accepting only P.A. III hogs (Smith 1998);
- Farmland, a large U.S. regional coop, not accepting livestock below their quality standards (Smith 1997)[1];

[1]Substandard does not necessarily imply poor quality in this case. Quality is defined by the end-user, and what would appear as poor quality to one may be high quality to another.

- DuPont, a large chemical company, working with Continental Grain Company, a large private grain company, to ship contractually-grown genetically-modified feed grains overseas (Johnson 1998).

While these activities are everyday practice in the manufacturing or service industry, this mentality is a fundamental change in the way agriculture has conducted business for the past 100 years. By not accepting farmer output or contracting for output, these groups are essentially choosing with whom they wish to do business, rather than hanging an "open for business" sign on the door and serving all who pass through.

Carriers able to tailor their programs to work closely with their shippers would become privy to better information related to scheduling and asset utilization. A systems approach to production and transportation should result in a greater percentage of traffic moving under longer—term contracts with volume requirements i.e., in terms of railroads, this means entering into more shuttle train and cycle trains contracts. This type of vertical coordination over a longer period of time has the effect of reducing the transactions costs associated with doing business. Arguably, all modes of transportation operate better in a scheduled environment, providing efficiencies to use as leverage in pressuring for standardization across and within country borders.

From a transportation supply perspective, what are the implications for non-system movements? The barge industry provides a good analogy. Currently, the majority of barges on the upper Mississippi River move under contract. The remaining few are not contracted and they trade in the corresponding spot market. Spot-market barges experience tremendous price volatility, depending on export demand. Like the barge industry, the truck market for transportation services should behave relatively the same way. As more and more trucks come under contract, the market for spot truck freight should become less stable, responding to demand pressures. Contracted truck freight, on the other hand, will remain stable. While the rail car market will not experience tremendous price volatility, due to the stickiness of rates, there will be a trade-off in terms of car supply. General tariff car supply will experience both greater and more numerous rail car shortages and surpluses. While spot truck freight and general tariff rail car markets will become more volatile, these spot markets should become a smaller and smaller portion of the total volume of freight. Unfortunately, most of the agricultural products which will have difficulty conforming to the systems approach will be those heading for export channels.

Issues that need to be addressed in the future are those regarding the importance of international grain trade between Canada, Mexico and the United States. In other words, are the issues local, regional or national in scope? For example, are the problems encountered similar to North and South Dakotas' anger with Canadian wheat imports depressing farmer prices? Or, is Canadian grain crossing the border to Minnesota for barge movement to the Gulf? The scope of the problem will play a large role in determining how much influence the transportation industry and its shippers can exert for the harmonization of border policies. To answer this question,

researchers need to identify the commodity volume being traded and the geographic areas affected by this movement. Once identified, estimates of the potential savings from unimpeded trade between Canada/Mexico/United States can be calculated. Next, researchers need to determine the price impacts on the receiving country, because support for leaving impedances in place will come from the receiving geography. Finally, researchers need to identify the changes required for freer trade and rank them by their respective values to the NAFTA countries involved. The question then becomes, "Who pays for the research? Canada? Mexico? The United States?"

Finally, researchers need to readdress the common carriage (service obligation) issue. Given the court cases on this issue over the past 10 years, what is a meaningful definition of common carriage? Recent deregulation of the transportation industry has placed common carriage in a new light. With carriers able to differentiate rates corresponding to service levels, the common carriage issue needs to be examined within service levels, rather than across service levels. This issue needs to be watched closely, as systems continue to evolve, in order to ensure fair treatment across shippers.

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Section 4

Institutional Factors Influencing Harmonization and Competitiveness

The objective of this section is to identify institutional factors, including those related to preserving the environment, which may conflict with trade and policy harmonization initiatives.

AGRICULTURE, TRADE AND STRUCTURAL POLICY UNDER NAFTA AND WTO

Don McClatchy and David Schweikhardt

INTRODUCTION

Last year's conference examined "harmonization, convergence and compatibility" of the agricultural policies of the NAFTA countries (Loyns et al, eds. 1997). Some, though not complete, progress was made towards achieving a common understanding and usage of these concepts. This year the subject is "economic harmonization." What do we mean by this? In this paper, it is taken as an abbreviation for "economic integration and policy harmonization."

Discussion in the workshop and papers to this point has focused on structural adjustments occurring in the Mexican, U.S. and Canadian grain-livestock subsectors, with some reference to their causes, and to their implications for international competitiveness, in each case. Technological change, market changes and policy changes are all seen as major determinants of structural change in the agri-food industry. We believe it is important to recognize the simultaneous relationship between structure and policy: Structural change can influence policy, while policy is also a determinant of the economic structure of industry.

Our task, with the focus restricted to the grain-livestock subsectors, is to build on the outcome of last year's workshop in identifying the major issues surrounding, and opportunities for, policy harmonization among NAFTA countries, and to say something about the implications of these for further structural changes in these agri-food sectors.[1] The most fundamental issue, addressed first, is whether policy harmonization is necessary or desirable. We conclude that it is both. Our subsequent sections briefly review progress to date with policy harmonization, point to institutional factors which will continue the drive toward greater harmonization in coming

[1]For the purposes of this workshop, we take "grain-livestock" to exclude dairy and poultry/eggs, and to include oilseeds.

years, identify opportunities for further harmonization, and discuss the implications of coming structural changes in the grain and livestock sector for the policy harmonization agenda. Our major conclusions complete the paper.

The concept of international policy harmonization, while more prominent in recent years, is not that new. A general recommendation of the Canadian Federal Task Force on Agriculture in 1969 (p.60) was that "domestic farm policy must be made consistent with changing international developments".[2]

WHY PURSUE POLICY HARMONIZATION?

Global economic integration is proceeding irreversibly, driven by technological change (particularly in communications and transportation), the removal of impediments to international capital flows and to trade in goods and services, and the evolution of international standards, global monetary markets, and multinational enterprises. Regional economic integration can be expected to proceed even faster. These developments imply a gradual loss of national economic sovereignty, and a growing need for cooperative management of the international economy (Bonnen, et al). They should be taken as givens, unable to be reversed by unilateral actions of any country, even the United States.[3]

Government attempts to regulate the operations of multinational enterprises in their own territory can result in the relocation of their activities elsewhere. Furthermore, when consumers' welfare doesn't seem to count for much politically, and when producers' surplus may accrue to owners or shareholders in other countries, analysis of whether a country's own interests lie with one or another policy option becomes increasingly blurred. Much of our existing economic welfare and trade theory seems to be falling behind reality in this respect.

Recent years have witnessed processed products comprising a growing proportion of international agricultural product trade. In contrast to global commerce in agricultural commodities where trade dominates and foreign direct investment (FDI) is small, FDI is the dominant form of international commerce in processed foods. In one sample of 144 food processing firms worldwide, sales from foreign affiliates exceeded exports from home countries by a ratio of 5 to 1 (Henderson et al, 1996). The (U.S.) Council for Agricultural Science and Technology (CAST) reported in 1995 that the 20 largest U.S. food sector multinationals were 14.7 times more likely to reach a foreign market through a foreign affiliate than through exports from the United States. West and Vaughan (1995) examined bilateral U.S./Canada food and beverage trade and found similar though less dramatic numbers. The latter also noted that a substantial portion of Canada's trade (55 percent of imports; 35 percent of exports) is intra-firm trade.

[2]Interestingly, that same Report also recommended, more specifically, that "the primary trade goal of Canada should be to negotiate a free trade Continental Market with the United States for livestock and livestock products, feed grains, oilseeds, potatoes and some fruits and vegetables." Food grains, and other commodities, were apparently seen by the Task Force to be excluded from such an arrangement.

[3]We do not mean to imply that we think it is likely that the U.S. would in future decide to pursue such a reversal.

New theories of trade under conditions of imperfect competition help to explain the motivation of firms to engage in FDI. However, they seem to be still inadequate in identifying the relative national interests in FDI versus trade, or in measuring trade benefits when the exporting firm is foreign rather than domestically owned. Certainly, barriers to international investment flows and national competition policies seem to be more relevant than trade policies in affecting this form of international commerce. Such measures are less likely to be commodity-specific or even agriculture-specific than trade measures. Hedley (1997) identified a wide range of policies other than agri-food policies (e.g., taxation, labour, education, environmental, social, etc.) that affect the investment and location decisions of food sector firms. For these reasons there appears to be a growing international acceptance that, lacking clear criteria for the success of national regulatory policies, it is better for governments to respond only to clear cases of market failure.

Regardless of the inevitability of global integration, most countries are persuaded that, on balance, globalization and multilateral free trade are to their benefit; i.e., that the gains from trade are real. NAFTA countries have a common interest in achieving reductions in agricultural protection and support in third countries, and are willing to pay the price of reducing their own tariffs and "coupled" support that such reductions would entail. International agreements for freer trade inevitably imply a greater degree of harmonization of trade policies. The extent to which they also necessitate harmonization of other broad economic policies has been the subject of theoretical debate for some time (e.g., see Johnson, 1972, Ch.16). Practical evidence suggests that, in the face of free trade and functioning regional and international markets, differences in national policies become, at best, a nuisance or, at worst, a serious political irritant.

Major grain-livestock policy differences between NAFTA countries in the past have occurred in the area of farm price support and "coupled" income support programs. Progressively, CUSTA, NAFTA and the Uruguay Round[4], in combination with a severe fiscal imperative for most governments in the 1990s, have done much to narrow these differences (see also next section). As such, support is reduced in magnitude in all countries, due to negotiated reductions in the level of border protection or due to fiscal restraint, then differences in the nature of that support become less important. Whether a "level playing field" is possible in the face of different types of support in different countries becomes less subject to dispute as the "level" approaches bedrock.

However, not all policies cost governments more money than they are willing to spend or are indirectly disciplined by trade agreements. The perception, by producers in any one country, about whether the "playing field is level" will also depend

[4]It may be prudent to add "the next WTO negotiations" to this list, recognizing that most governments don't like to be seen to be giving in to international pressure, and prefer to position themselves, by unilateral action, to stay ahead of international commitments. By having made only minor use of export subsidies and no deficiency payments for several years, the United States, for example, could argue for the elimination of both the "blue box" and agricultural export subsidies in the next round, and be argued to have already been affected by this anticipated outcome.

on the nature and cost of other countries' interventions in areas outside the scope of constraints imposed by trade agreements. And good hemispheric relations in the broad sense are usually seen by governments as much too important to be held hostage by agricultural disputes. Thus, governments may seek to lay the groundwork for broader policy goals by pursuing agri-food policy harmonization. Establishing the perception of equitable treatment under policies and programs in areas such as crop insurance, disaster payments, conservation, floor price safety nets, decoupled income support, pesticide licensing and marketing legislation and regulations can facilitate addressing broader policy issues in non-agricultural areas.

Another justification for harmonization derives simply from the difficulties of achieving smoothly functioning regional and global markets when grades and standards and other regulations differ between countries. Rail rates, variety registration / licensing, container sizes, labeling, customs procedures, grade specifications (wheat, malting barley, beef, pork), and permitted pesticide residue levels all provide examples where scope exists for more uniformity of regulation, to mutual benefit, among NAFTA countries in the grain-livestock sector.

We conclude that policy harmonization is not only desirable, but that it will become increasingly necessary in the emerging agri-food system.

PROGRESS TOWARD HARMONIZATION

In discussing, in 1998, grain-livestock policy harmonization, it is important to recognize that much has already been achieved in recent years. Casco (1997) provided a useful summary of the very ambitious Mexican agricultural policy reforms of the past fifteen years. Most importantly, Mexico's reform of its domestic corn price support program in the late 1980s allowed it to take on the related trade barrier reduction commitments required by NAFTA, creating the possibility of market-determined feed grain imports, and removing a major discrepancy between its grain policy and those of its northern trading partners. At the same time, Mexico's commitment to NAFTA provided a guarantee that its domestic policy reforms could only be reversed at a political and economic cost that would probably be prohibitive. Under the PROCAMPO program, major crop price supports are being gradually replaced with direct payment support, based on fixed per hectare payments, and decoupled from production conditions. The introduction of hedging activities by Mexican Government agencies—on behalf of Mexican producers collectively, using U.S. commodity exchanges as a means to achieving a degree of stability in producer prices—is an important innovation.

The United States never provided a significant level of direct commodity support for oilseeds, pork and beef. Beginning with the 1985 farm legislation, with further steps in 1990 and 1996, U.S. cereal expenditures have been made progressively more decoupled, and price support a progressively less important component of total cereal support. Target prices and deficiency payments represented the core of

U.S. crop policy, and their elimination, in 1995, ranked in relative national significance with the departure from corn price support in Mexico, and also removed the "budget offset" argument for proponents of grains export subsidies (IATRC).

Canadian government spending in the red meats and grains support areas is now running at only a fraction of peak levels reached in the late 1980s, and many major programs (WGSA, GRIP, WGTA, FFA, ASA and some other short-lived ad hoc programs) have been eliminated.[5] Repeated U.S. countervailing actions over time have turned Canadian pork and, particularly, beef producers against subsidy programs. Tariff protection for beef has been made equal with that of the United States (from 1994) and beef producers have even declined to participate in the new non-commodity-specific Net Income Stabilization Account (NISA) program, even though it has been judged to be exempt from countervailing action under U.S. law. The elimination, subsequent to the Uruguay Round, of the western grains transportation subsidies, which were effectively export subsidies, removed another policy quite different from the closest U.S. equivalent (Export Enhancement Program [EEP]), and which happened to also cause a major downward distortion to beef and pork production, and other grains processing activities, in the prairie region.

Cereal grain seems to be the one grain-livestock commodity area to continue to exhibit glaring and contentious differences between remaining Canadian and U.S. policies (elaborated further in our next section). However, even here considerable progress has been recorded. Access of U.S. suppliers to the Canadian marketing system is now restricted much less than previously. The last few years have seen U.S. grain moving to port on the Canadian rail system. The planned acquisition of Illinois Central by C.N. Rail appears to bring closer the movement of some Canadian grain to export through U.S. Gulf ports. Canadian rail freight rate deregulation is reportedly close to going ahead. The Saskatchewan Wheat Pool's evolution from a pure cooperative to a public company, together with its diversification into a much broader range of economic interests, makes it look much more like some of the large U.S.-based private-sector companies, and may provide a lead which other Canadian grain cooperatives will follow.[6] Some progress has occurred in 'lengthening the arm' between the Canadian Wheat Board (CWB) and the Canadian Government: Bill C-4, now before the Canadian Parliament, encompasses several revisions to the Canadian Wheat Board Act.

In the regulatory area, there has been considerable collaboration, over time, between the U.S. and Canada in moving towards more similarity in pork, beef and grain grading systems. While still not fully compatible (e.g., Canada retains its "index" system for hogs which rewards leanness), all are more so than they used to be.[7] Furthermore, the scope for Canadian farmers to contract for supplies according to buyers' own specifications is gradually increasing (e.g., the relaxation of obligatory hog marketing through monopoly cooperative marketing boards in many provinces).

[5]Acronyms used here: WGSA - Western Grains Stabilization Act; GRIP - Gross Revenue Insurance Program; WGTA - Western Grains Transportation Act; FFA - Feed Freight Assistance; ASA - Agricultural Stabilization Act.
[6]Merger discussions between the Manitoba Pool Elevators and the Alberta Wheat Pool were reported in the Toronto Globe and Mail of 22 April, 1998.

It is evident that some harmonization has been achieved by amputation (e.g., Canadian transport subsidies and U.S. deficiency payments) and other by reconstructive surgery (ongoing changes to the CWB and evolution of the NISA program in Canada). In general, the oilseeds, pork and beef areas are now relatively trouble-free. Major remaining grains/livestock policy harmonization issues are confined to the area of cereal grains.

MAJOR OUTSTANDING INSTITUTIONAL ISSUES

At least three aspects of existing U.S. policies cause concern for Canadian grains farmers. One is that direct payments to U.S. crop farmers remain high, that the planned phase out over seven years of a major part of these remains uncertain and potentially reversible by Congress, and that, although much more decoupled than previously, such payments can never be fully decoupled.[8] A second is that grain export subsidies (EEP), and 'permanent' U.S. farm legislation dating from the 1930s, remain 'on the books', even though not currently used. Absent a policy about-face in this regard by the United States, these first two concerns are likely to lessen with the passage of time. Canada can still be expected to do its utmost in multilateral negotiations beginning in 1999 to eliminate the possibility of the use of export subsidies by the United States. The latter country may be ready to make this commitment at that time, subject to obtaining the same commitment from all other countries. The third concern is U.S. export credit guarantee programs, particularly GSM 103 which, with its long (up to 10 year) repayment provisions, goes well beyond what all other Organisation for Economic Co-operation and Development (OECD) countries have agreed to be appropriate for most agricultural products.

The continued existence of the CWB is certain to be the major Canadian thorn in the side of the United States in the grain-livestock area. As a state trading enterprise it is one of a number of international targets, including the state importing agencies of large markets like China, Japan and Russia, and other major single-desk exporters, such as the New Zealand Dairy Board and the Australian Wheat Board. The United States is expected to make state trading agencies a priority issue in the next round of multilateral trade negotiations. It seems very likely that other monopoly exporters (e.g., the Australian Wheat Board or New Zealand Dairy Board) will be radically changed in coming years, increasing the pressure for the CWB to be similarly modified (Dobson, 1998).

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[7]Some analysts question the relevance of national grading systems and suggest that they will become redundant in the future as "designer commodities" proliferate. Martin (1994), for example, notes that large loin eyes and absence of "PSE" (pale, soft exudative) in pork both have considerable market value, but neither is rewarded by Canada's hog grading system.

[8]Although lower than payments in the peak support years of the 1980s, U.S. crop producer payments have declined proportionately less than Canadian crop producer payments since that period, and Canadian producers are well aware that these U.S. payments are currently higher than they would have been had the pre-1996 legislation continued.

From a competitive perspective, the relative lack of transparency surrounding the Board's operations is a source of suspicion (about possible hidden government subsidies and/or other unfair advantages) and concern to U.S interests. It is difficult to envisage U.S. pressure diminishing on this issue until the CWB loses its monopoly status, is made completely independent of the Canadian government, and operates with a degree of transparency comparable to large private sector grain marketing enterprises. A Toronto Globe and Mail editorial recently (3 Feb. 1998) pointed out that the CWB is one of the few Canadian federal institutions not subject to the Access to Information Act or the scrutiny of the Auditor General. It characterizes Bill C-4 (1998) as "leaving the Wheat Board as it has always been: a secretive monopoly". Ironically, the fact that the CWB existed in recent years, and acted to restrain Canadian grain flows into the U.S. market, probably resulted in some price benefits for U.S. grains producers and lower fiscal costs of EEP expenditures.

The CWB provides intraseasonal price pooling for Western Canadian grain producers. With the hedging opportunities now available to farmers, this feature is probably of less value than it once was, and undoubtedly is a deterrent to use of hedging by Canadian grains producers.[9] Similarly, if and as targeted export subsidies and state trading by other countries (which serve to segment export markets and create artificial price differentials) are phased out in the future, another current justification for the CWB's existence will be weakened.

Both the United States and Canada provide minimum effective producer price schemes for wheat and barley, which, although distinct in nature, are similar in effect, at least for producers.[10] The U.S. "loan rate" price corresponds to the Canadian "initial payments" price. Both prices have been maintained at conservative levels in recent years, and have not influenced farmers' returns in either country for some years. However, in the event of a major decline in world market prices, U.S. producers would be assured of receiving at least the loan price, as loans may be repaid at market prices if these are lower than the loan rate. In Canada, the federal government still finances any "pool deficit" between the average CWB sale price for the season (less marketing costs) and the announced "initial price". The inconsistency arises because the U.S. loan rates are formula-based on 5-year moving average historic prices (though also subject to legislated upper limits) whereas the Canadian initial prices are based on market prospects for the coming season. There are also elements of price forecast signaling and advance payments in the Canadian mechanism.

The differences between the two countries grain grading systems are the source of several other inconsistencies throughout the whole grain marketing system in operation in each country. In both countries grading is based on visual characteristics. In Canada, unlike the U.S., only varieties which are visually distinguishable are licensed for use. In effect, it is probably accepted on both sides of the border that the Canadian system, administered by the Canadian Grain Commission (CGC),

[9] It may also be a deterrent to the development of the Winnipeg Commodity Exchange.

[10] Note that, while guaranteeing minimum prices to producers, neither of these schemes as currently operated provides a floor support to respective domestic market prices.

results in more consistency in the delivered product.[11] This superior consistency and reliability of the Canadian product is valued by some buyers and gives rise to a recognized premium for Canadian grain, relative to the price paid for the same average quality grain from the United States, in some overseas markets.[12] Naturally, this is an advantage which Canadians are loathe to abandon. Unfortunately, maintenance of the integrity of the Canadian system requires that, to the extent that visually indistinguishable varieties are imported, care must be taken to ensure that they be segregated from Canadian export grain in the process of elevation and transportation. Thus the different grading mechanism gives rise to a whole set of regulations and restrictions in grain production and marketing in Canada which are not present in the United States. These differences have their costs. A simulation study by Wilson and Johnson (1995) found, for example, that relaxing variety release requirements or increasing the use of contracting, to allow greater production of 6RW barleys in Canada, would generate increased Canadian penetration of the U.S. malting barley market and higher grower prices.

The CWB could be argued to have been ahead of its time in historically providing a product very carefully controlled and designed for the needs of its customers. Unfortunately, it has focused its attention on just one group of customers for milling wheat (those seeking high quality bread wheat) to the exclusion of others, and in so doing may have discouraged or prevented the production in Western Canada of other wheat more suited to the needs of other potential customers. It has been suggested that, as a consequence, in an average year it must market more high quality bread wheat than the premium export markets for this type of wheat can absorb, with the result that much of the high quality crop must be sold at a discount. Apart from generating accusations of discriminatory or even predatory pricing, such an outcome also represents a loss for Canadian farmers who, in theory, could have been serving such markets with higher-yielding lower-quality wheat for greater economic gain. In addition the low rate of historic gain in Canadian wheat yields is claimed by some to reflect the constraint placed on Canadian wheat breeders by the visual distinguishability requirement of the licensing system.

Crop insurance and disaster expenditures, although not identical, are probably viewed as comparable enough to not give rise to serious concerns in the other country. U.S. conservation expenditures, although relatively much higher than comparable Canadian programs, are unlikely to cause problems in Canada, because most Canadian farmers recognize that they also benefit from the price enhancing

[11]See, for example, a series of USDA/ERS papers to appear in the 1990's subsequent to directives in the 1990 U.S. agricultural legislation, and cited and summarized in Mercier and Hyberg.

[12]Care must be taken, in making such comparisons, to recognize that part of the "Canadian premium" may derive from factors other than the Canadian grain's superior consistency/reliability, such as Canada's provision of carefully scheduled, "just on time" delivery for clients with limited storage capacity, the obligatory cleaning of Canadian grain prior to export, or even possibly the ability of the CWB to price up where it appears that a foreign state purchasing agency has a (relatively price-inelastic) "Canadian quota" as part of its supply diversification policy.

effect of the lower U.S. production which these programs bring. Moreover, such policies tend to be decoupled from both market prices and production decisions, creating fewer inequities requiring harmonization.

In the pork and beef areas, both countries' producers express concerns from time to time about each others' sanitary restrictions on live animal trade and border inspection procedures. Canadian and (some) U.S. producers also seek a recognition of equivalency in grading such that imported meat could be given the importing country's grades (Hayes and Kerr, 1997). However, in general, recent years have witnessed cooperative bilateral relations between pork and beef producers, and the two countries' policy regimes are working harmoniously in these areas.

A key Mexican irritant in recent years for Canadian oilseed interests has been the high rate of duty on imports of canola oil (in the order of $45/tonne). Coupled with a relatively low duty on seed imports, this serves as a significant protection for the Mexican crushing sector. More importantly, acting in parallel with similar protection in Japan, it creates a situation where foreign seed buyers can bid up the price of seed and erode domestic crushing margins in Canada (although benefiting Canadian growers). However, time will solve this problem as Mexico's tariffs on products from its NAFTA partners are gradually reduced to zero. Another issue of current concern for Canada is Mexico's administration of its barley tariff rate quotas (TRQs), which, in the main, limits Canada's exports to malting barley. Canada would like to be allocated the unused part of the U.S.'s barley TRQ into Mexico.

OPPORTUNITIES FOR FURTHER HARMONIZATION

At the outset, it may be important to recognize that the subject is harmonization among unequals. The U.S. market is relatively more important to the Canadian producer than vice versa. In plurilateral negotiations, the bigger players tend to call the shots. Whether or not it is 'fair' or 'just', the reality may be that Canada and Mexico may need harmonization more than the United States does, and may have to be prepared to move further to get it. Consequently, the 'opportunities' for further harmonization we have identified below would generally involve more actions on the Canadian side than on the U.S. side.

Multilateral Trade Negotiations. Both countries have several common interests which could be pursued in a future round of multilateral trade negotiations. These include the elimination of export subsidies, and the "blue box" policies permitted in the Uruguay Round Agreement (URA). Committing to abstain from the use of export subsidies and "direct payments under production-limiting programs" would lock in some of the policy changes already operational in both countries, thus increasing the permanency of current progress towards harmonization in some policy areas. Tightening the "green box" criteria would result in more common interpretation of the requirements of this box, and, consequently, less variability of green programs that may be introduced in different countries in the future. Further reductions in tariff levels vis-à-vis third countries will normally result in more Canadian/U.S./

Mexican consistency in such tariffs, where they are not already equal. There is also scope for achieving strengthened disciplines on TRQ administration, and more consistency in NAFTA country practices in this regard.

Minimum Producer Price Mechanisms. The U.S. and Canadian governments could collaborate in the setting of consistent "loan rates" and "initial prices," respectively. Since U.S. loan rates are legislatively established and would require congressional action to change, and Congress might reject such a loss of sovereignty as unacceptable, a similar outcome could be achieved if Canada would announce a policy of adopting initial prices consistent with prevailing U.S. loan prices, and matching any subsequent U.S. adjustments. The knowledge that Canada was applying such a policy would inevitably be taken into consideration by U.S. decision-makers when choosing their own loan rates.

There would appear to be clear benefits to the Canadian government in confining its guarantee of initial prices to essentially the same as the U.S. government now provides under its loan program—namely, a low-slung, market-linked floor support to effective producer prices. The current 'price signal' role of initial prices could be taken over entirely by the "forecast pool returns" now offered regularly by the CWB. Similarly, leaving decisions on advance payment levels, and the risk involved, entirely to the CWB, would be a significant contribution to reducing the perceptions of government control, and of lack of risk in the market place, in the eyes of CWB critics. Such changes could be made under the enabling legislation of Bill C-4, now before Canadian Parliament.

CWB Pooling/Pricing to Producers. As already discussed, events over time are reducing the need for pooling. Assuming pooling will not be abandoned, however, the CWB could explore the use of different payment mechanisms. For example, it might purchase its grain on similar terms to private sector firms, perhaps at a slight discount but with a much higher up-front payment to farmers than at present, and pay out an additional "cooperative dividend," if any, at the end of the season. This would give the perception of its having to assume a level of risk much more comparable to the private sector grain marketing companies. Such pricing mechanisms would be similar to those used by some cooperatives in the United States, making Canadian pricing practices more consistent with those of U.S. farmer cooperatives. The 1996 (Canadian) Western Grains Marketing Panel proposed several other ways in which more flexibility could and should be built into the CWB pricing mechanism, including the possibilities of making cash purchases (e.g., under contracts referenced on spot or futures prices on the Minneapolis Grain Exchange), of paying farmers for grain storage, of closing pools earlier, and of allowing farmers to cash out of pools or to trade negotiable pool certificates.

CWB Government Links and Transparency. By appointing its Commissioners, the responsible Canadian minister still retains effective control over the CWB. Bill C-4 proposes certain changes to its administrative structure which would phase in some election of directors by producers, without relinquishing effective control for the Government through the appointment of the Chair. The Board could be transformed

into a true cooperative, accountable fully and only to its members, and with all directors elected and a Chief Executive appointed by them. Such changes would establish a governing structure more comparable to those of U.S. agricultural cooperatives, alleviating questions about the effective control of the CWB. It seems reasonable to assume that international concerns about transparency would be much less of an issue if the CWB was transformed into a true cooperative and ties with the Government were cut. Domestic suppliers' concerns about CWB accountability and transparency can be expected to continue to grow.

CWB Monopoly. The obligation for Western Canadian wheat and barley producers to market through the CWB will, for as long as it lasts, cause the Board to continue to be perceived to be a state trading enterprise, and remain subject to international (particularly U.S.) criticism and pressure. There is already considerable domestic pressure within Canada in the direction of reducing or removing the CWB monopoly. The Western Grains Marketing Panel recommended (1996) that feed barley be removed from CWB exclusivity. Polls seem to indicate that a majority of farmers prefer a "dual marketing" option of being able to supply the CWB or to market privately. Many farmers have already challenged the Board's authority, in court and in other ways. In 1998, a Manitoba Court of Appeal found that, contrary to popular belief, the CWB was not obliged to get the best price for farmers, and that it "owes them no duty of care".[13]

The Western Grains Marketing Panel (1996) effectively proposed that the CWB monopoly could be changed to a monopoly on the use of existing Canadian wheat grades, which would continue to be subject to varietal controls. This would allow the CWB to continue to service clients who sought the top quality bread wheats and the high level of intraseasonal consistency which the current system provides. But such a change would also allow producers who so choose to grow unlicensed wheat varieties and sell the grain to private sector buyers. Such a system would imply the need for careful segregation of 'identity-preserved' CWB wheat and differently-graded other wheat at all stages in the elevation, transport and export system. This may be facilitated by the large increases in Canadian elevator capacity currently underway, and by the more frequent use of containers as a grain transportation mode.

It seems likely that, in the event that it lost its wheat export monopoly status, some international customers would continue to prefer to do business with the CWB, and that it would at least retain its business in the lucrative Japanese market, as well as others. This should make it attractive as a marketer of choice for many Canadian farmers. Consideration could also be given to making the CWB services available to U.S. farmers, particularly in northern tier states, who were willing to grow Canadian-licensed varieties for the CWB under contract. CGC services could also be provided to such farmers. The U.S. could cooperate in removing any obstacles to such practices. Such actions would help the CWB to remain viable, perhaps at a smaller scale of operations, even after such a loss of monopoly status.

[13]This finding was part of a decision brought down by Justrie C. Huband in the case of M-J Farms Enterprises Ltd., reported September 29, 1997.

Grain Grades and Standards. The question must be asked whether for grains, just as for red meats, a national grading system will ultimately be needed. With increasing use of buyer specifications of particular end-use characteristics, there is alternatively the possibility of private sector third parties providing a testing service as, for example, in France. Assuming, however, that there is a perceived need for national grain grading to continue, it would seem to be highly desirable for both countries to cooperate in developing a common grain grading system which sought to improve the consistency and reliability of the current U.S. system, but which, in Canada (at least for non-CWB grains), replaced visual assessment with a practical, low cost and scientifically objective grain testing procedure to provide standardized specifications of key attributes including moisture, gluten and protein content. Several tests not in widespread use are understood to already exist. With adequate research funding, including contributions from both sides, it seems inconceivable that modern science and engineering would not be equal to the task of developing practical procedures applicable at a reasonable cost. Mercier and Hyberg (1995) point to the potential advantages of including important intrinsic (end-use) characteristics as grade-determining factors, or at least providing inspection certificates which describe accurately the status of the grain in terms of these characteristics and based on objective tests.

In summary, we would advocate the full harmonization of U.S. and Canadian 'off-Board' grading standards, and thus would go further than the Canada-U.S. Joint Commission on Grains (1995). The recommendation of the latter for standardization of grading methodology (sampling procedures, moisture measurement, protein measurement) would seem, however, to be a bare minimum requirement. The two official agencies—the Grain Inspection, Packers and Stockyards Administration (GIPSA) and the CGC—have been reported to be collaborating towards this end for several years.

IMPLICATIONS OF STRUCTURAL CHANGE IN THE AGRI-FOOD SYSTEM

The global integration of national economies and the subsequent harmonization of agricultural policies are occurring at the same time that the agri-food system is undergoing a "quiet revolution" that is changing the economic structure of industries throughout the system. Many of the changes occurring in the food system are partly caused by, and reinforcing of, the changes in policy caused by harmonization. These changes will in turn raise new issues in policy harmonization in the future.

The changes occurring in the food system are a result of changes in consumer demands and changes in the system's capacity to fulfill those demands. Consumer demands are changing to reflect a greater demand for food ingredients with specific quality characteristics. A greater emphasis on freshness, nutritional quality, consistency, convenience, and variety at the retail level creates a farm-level demand for commodities with specific ingredient characteristics necessary to produce foods that satisfy the demands of consumers.

The Driving Force of the Changing Consumer. Much of the change in the food system is driven by the rising demand for convenience by consumers. With the changing family and work structure of many families, and particularly with the rising economic value of the time of women working outside the home, consumers are demanding a higher level of preparation, combined with a high level of quality. In the United States, for example, nearly sixty percent of working-age women are employed outside the home, with mothers tending to have the highest levels of employment outside the home. Changes in family structure reinforce this trend, with two major groups—unmarried singles living alone and single-parent families—representing the fastest growing portions of the U.S. population (Mogelonsky, 1995).

These trends suggest that the economic value of time for food consumers is rising, with the opportunity cost of the time used to shop for and prepare food becoming prohibitive for many consumers. This reality is reflected in the rising proportion of meals consumed away from home or purchased in prepared form for consumption at home. Americans spend nearly 50 percent of their food expenditures on food consumed away from home (representing nearly 37 percent of the total food consumed). In perhaps the most telling indication of the time stress faced by many consumers, a recent retail industry survey found that 70 percent of Americans do not know what they will have for their evening meal at 4:00 p.m. in the afternoon (Food Institute, 1998). When food purchasing decisions are made on-the-run, it becomes obvious why the food retailing industry now views itself as being a direct competitor with the food service industry in providing prepared meals to consumers. To do otherwise would forfeit an even larger share of food sales to the food service industry. Such patterns are observed in many countries as the economic development process proceeds (Heijbroek, 1995). In Mexico, for example, single people, higher income people, and working women tend to consume more meals away from home (Food Marketing Institute, 1995).

Even the fundamental notion of food retailing as a physical location where consumers must go to buy food is being challenged by the rising demand for convenience. On-line grocery shopping is now available by internet in many U.S. cities, and, while the success of these firms has been limited, industry analysts believe that such shopping services will serve a significant portion—probably the higher-income portion of the population that is highly desired by food firms—in the next 10 years, with a consensus forecast by industry analysts suggesting that 20 percent of U.S. grocery sales will be sold through electronic transactions by 2008 (Food Institute, 1996 and 1997).

Combined with this demand for convenience is a demand for variety and quality that creates an intense pressure within the food industry to provide a continuing supply of products and services that satisfy consumers' desires. This results from an increasing ethnic diversity (Mogelonsky; Senauer, et al) and from consumers' desire to experience new foods (Pierson and Allen, 1993). New food product introductions in the United States have averaged 15,000 items in recent years, though the success rate of those introductions remains minuscule. This demand for variety

suggests that the derived demand at the farm level for food ingredients that provide specific characteristics essential to the production of specific food products will continue to increase.

Industry Responses to the Changing Consumer. At the same time that changing consumer demands require farm products with increasingly specific characteristics, changes in technology are permitting input suppliers to develop plants that supply those ingredient characteristics (Barkema, Drabenstott, and Welch, 1991). Genetic modification of plants to provide pest protection is now commonplace, with 20 percent of corn acreage, 30 percent of soybean acreage, and 50 percent of cotton acreage in the United States being planted to genetically modified seeds (Kilman, 1998).

These developments remain unrelated to the final characteristics of the crop, however, with additional new products that supply the characteristics demanded by end-users just beginning to emerge from laboratories. Seeds that are modified to contain specific levels of oil, starch, or protein, specific amino acids are emerging (Phillips, 1994). These may be followed by plants that are designed for specific industrial uses or the production of industrial or pharmaceutical chemicals. One industry forecast sees the current genetically engineered products as the first wave of "crop protection traits," to be followed by the introduction of plants designed for their crop quality traits (end use characteristics), followed by productivity-enhancing agronomic improvements and, within fifteen years, the introduction of plants designed as inputs for industrial products (Looker, 1998).

A Second Generation of Harmonization Issues. The changes occurring at both the retail level and the farm input supply level of the food system will be accompanied by changes in the marketing institutions in the grain, oilseed and livestock industries. Open market production, guided by price determination in spot and futures markets will be replaced, in many cases, by contractual relationships that determine production practices, establish delivery schedules and locations, and protect the property rights of the investors in new seed technologies. Policies and pricing institutions based on an assumption of homogeneous commodities, including such fundamental policy tools as U.S. loan rates, may be unable to provide the information-intensive coordination functions required in a grain sector driven by end-user demands. In some cases, institutional harmonization may come as a private sector initiative led by seed supply firms (perhaps better called "genetic information supply firms"), agri-food manufacturers and retailers (perhaps better called "end-user information supply firms") and grain handling firms (perhaps better called "logistical information supply firms"). These firms will own the three essential forms of information needed to operate a grain marketing channel in the emerging food system.

These changes also suggest that recent efforts at harmonization, though important, are likely to soon give way to a "second generation" of harmonization issues. These issues will focus on three areas. First, intellectual property rights, and an ability to protect intellectual property rights, will be central to the functioning of the emerging grain sector. Second, property rights over other forms of information—

such as information derived from on-farm application of genetically engineered products and collected through Global Positioning and Geographic Information Systems—will determine the ability of firms to capture the return on their investment in genetically modified plants. Third, contract law, and its application to vertical relationships among firms, will govern the institutional structure in which vertical alliances will be formed. These areas of policy, while not completely new to agricultural policymakers, will require a dramatic broadening of the policy agenda to include areas of law far beyond the price-based policies that have dominated agricultural policy discussions in recent years.

CONCLUSIONS

There has already been considerable progress in recent years in U.S./Mexico/Canada policy harmonization in the grain-livestock sub-sector. In the livestock area and for many crops, including oilseeds and the minor cereals, there are no serious policy disharmonies between the Unites States and Canada. Wheat and barley pose the key remaining problems.

Conventional wisdom in the Western Canadian grain sector seems to be that if the CWB's monopoly is removed it will not survive domestic competitive pressures. We conclude that if the CWB's monopoly is *not* removed it will not survive domestic and international political pressure. If both are correct, it follows that the CWB will not survive either way. However, we suspect that the CWB could continue to be viable, perhaps at a reduced scale of operations, even with the loss of its monopoly status. The 1996 recommendation of the Western Grains Marketing Panel to allow Canadian farmers the flexibility to grow unlicensed varieties and sell to the private trade, and to confine the CWB monopoly to the marketing of wheat using the traditional Canadian "appellations," should be adopted by the Canadian government.

Both countries should devote significant resources to the development of a practical, scientifically objective and mutually acceptable grain measurement technique and grading system (the latter to be applicable to off-Board wheat in Canada's case). The objective here should be to improve consistency and reliability of the current U.S. system while avoiding the need for visually distinguished grades and licensing.

Canada should coordinate its initial payments levels with the prevailing U.S. loan rates so as to ensure the same levels of minimum effective producer price guarantee for major grains in both countries.

Changes in consumer demands and technology will raise a new set of policy harmonization issues. These issues will range far beyond the price policy issues that have dominated the agricultural policy agenda in recent years and will determine the institutional structure of agri-food markets.

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ENVIRONMENTAL POLICY CONSIDERATIONS IN THE GRAIN-LIVESTOCK SUBSECTORS IN CANADA, MEXICO AND THE UNITED STATES

Dave Ervin and Glenn Fox

INTRODUCTION

This paper explores several themes in the relationship between trade liberalization and environmental protection. In recent years, this relationship has become both more controversial and more important. We attempt to build on some ideas that were examined at a workshop of the International Agricultural Trade Research Consortium in Toronto in 1995 (Bredahl et al., eds. 1996) and at the Third Agricultural and Food Policy Systems Information Workshop in Tucson in March 1997 (Loyns et al., eds. 1997). In order to set the context of what follows, we discuss the emerging consensus on the environmental effects of agricultural trade liberalization under both the Uruguay Round Agreement (URA) and under the North American Free Trade Agreement (NAFTA) and we examine the available evidence on the potential effects of domestic environmental regulations on competitiveness and ultimately on trade in agricultural commodities. We then turn our attention to some conceptual and practical issues that will need to be resolved before much more progress can be made in the integration of trade and environmental policies. The general focus of our discussion is on the crop and livestock industries of North American agriculture, but many of the issues that we discuss transcend these sectoral or geographic boundaries.

The purpose of this paper is two-fold. First, we will attempt to lay to final rest some enduring speculation about the effects of trade liberalization in agriculture on environmental quality and about the impediments to trade embodied in national or subnational environmental policies. Our assessment of the growing empirical literature on these questions is that both effects are small when measured at a national level, but that there are important intranational adjustments in production, transportation, trade and consumption that seem to have been underappreciated. Our second

purpose is to stretch the conceptual boundaries that we have in mind when we talk about policy harmonization. Typically, "policy" has meant national governmental policy. But policy is made by subnational levels of government and it is also made by voluntary trade associations, by firms and by individuals. Sometimes policy made in these other contexts contradicts initiatives made at the national level and sometimes it reinforces those decisions. But what has not been adequately recognized, in our judgement, is that policy decisions at the non-national governmental level can be a substitute for national governmental policy. We characterize this as a Coasian perspective, but we are mindful that in so doing, our message may be as misunderstood as was Coase's original paper. The cumbersome process of policy integration at the national governmental level described by Josling (1997) provides the rationale for policy action at other levels and through other means. But it also creates analytical challenges to a discipline that has traditionally conceptualized policy more narrowly.

Trade liberalization and environmental protection continue to enjoy considerable political and intellectual support in Canada and the United States. We do not anticipate that this will fundamentally change any time soon. But the constituencies for the two agendas have, traditionally, not overlapped greatly. With the inclusion of agriculture in the multilateral trade liberalization process under the General Agreement on Tariffs and Trade (GATT) and now the World Trade Organization (WTO), and the efforts of the negotiators of the NAFTA to include agricultural trade in that regional exercise in trade liberalization, it has become increasingly important to build some bridges between these largely disparate constituencies. These bridges are needed to forestall political gridlock that would impede progress on both agendas. We see this as both the rationale for and the terms of reference of the North American Accord on Environmental Cooperation (NAAEC).

The scope of issues covered under environment also requires comment. The natural environment is composed of physical and biological resources, such as air, water, soil, plants and animals. These resources serve production and consumption needs and also are valued for their non-consumptive uses. They may be held as private or several property, they may be owned as common property or as government property, or they may exist in a state of open access where the ownership rights to exclude others are not vested in any individual or organization. In the discussion that follows, we are primarily concerned with the effects of changes in the production, distribution, retailing and consumption of products that originate on farms in response to reforms of agricultural or environmental policies. We limit our discussion to environmental effects in the form of changes in water quality or quantity, the degradation of topsoil, the loss or gain of wildlife habitat, and air quality changes. Often environmental effects are defined to include human health effects, either in the form of operator or third party safety issues or food safety concerns. Humans are part of the biosphere, but consideration of these types of human risks and benefits related to trade liberalization in agriculture is beyond the scope of this paper.

ENVIRONMENTAL EFFECTS OF TRADE LIBERALIZATION

Trade treaties do not occur in a market or policy vacuum. Contemporaneous changes in demand and supply, or in domestic policies, driven by factors that can be largely independent of those that influence the outcome of trade negotiations, have effects on production and consumption that are confounded with the effects of trade policy changes. In the case of Mexico, the URA and the NAFTA are the most recent phases of a process of policy reform that began in the mid-1980s (OECD, 1997). Mexico joined the GATT in 1986. In 1987, Mexico unilaterally exceeded its GATT commitments and reduced its maximum tariff rate to 20 percent. Prior to Mexico's entry into the GATT, its agricultural policy emphasized national self-sufficiency in staple food grains, food subsidies for low income urban consumers and both output price supports and input subsidies for domestic producers. Falling government revenues from oil in the latter half of the 1980s prompted a reform of those policies in the direction of more liberal markets and improved efficiency of resource use in the agricultural sector. Both the URA and the NAFTA effects on Mexican agriculture need to be seen, therefore, in the context of this longer process of policy and institutional reform.

The effects of trade treaties on production, consumption, transportation and trade go beyond the direct effects of tariff reductions and relaxations of quotas on prices. Recent work by Runge and Fox (1998) on the effects of the NAFTA on the North American cattle and beef industry are a case in point, but the effect may also be operating in the hog industry. At one level, the effect of the NAFTA on tariffs and quotas in cattle and hogs between Canada and the United States was trivial[1]. But the NAFTA also sent an important signal, not in the form of tariff reductions but rather as a symbol of a "cease-fire", in the trade tensions in red meats that had been acrimonious for at least two decades.

Several presentations at this workshop address the task of quantifying the effects of the URA and the NAFTA on the agricultural economy of North America. While these agreements were being negotiated, several studies attempted to characterize the potential effects of different hypothetical levels of liberalization. The general finding of this literature was that, at least at a national industrial level of aggregation, the effects of removing all tariffs, export subsidies and quantitative restrictions on trade in agricultural commodities would be small. This result rests on the generally inelastic demand and supply relationships that have been estimated using historical data and econometric methods. The limited empirical work that has been conducted in the same vein since the actual terms of the URA and the NAFTA have been available and continue to indicate small effects on world agricultural production and prices[2].

[1]The effect of the NAFTA on the Mexican cattle and beef industries, through decreased tariffs and increased market access, was more substantial (Runge and Fox, USITC, OECD).

[2]See Tanner (1997) for a synopsis of modeling efforts on the URA.

Environmental Impacts

Our view is that agricultural trade liberalization affects prices of products and inputs through the reduction of tariffs, the relaxation of quantitative restrictions on products or inputs, and the harmonization of technical standards. Compliance with the terms of a trade agreement may also require the modification or even the elimination of programs and policies that influence farm production decisions and actions further down the supply chain. The primary impact of these changes occurs when producers and consumers respond to new market opportunities. It is these changes that, for agriculture, lead to the first round of environmental effects of trade liberalization. These effects may be positive or negative, from an environmental point of view. Second round effects come as these changes in production and consumption translate into changes in transportation and trade. This can create environmental impacts if goods are transported longer or shorter distances or using different means of transportation. Of course, these effects could also be positive or negative.

A third round of environmental impacts of trade liberalization arises through the effect of liberalization on economic growth. The relationship between trade liberalization and environmental quality is complex. This relationship has been examined from several perspectives. Some environmental critics of trade liberalization have argued that if economists are correct in their claim that the dismantling of protectionism raises the average standard of living of citizens of the country whose trade policies have been liberalized, and if higher levels of income translate into greater pressure on global natural resources, then trade liberalization should be rejected on environmental grounds.

The key empirical relationship in this assessment is the one between economic growth and environmental quality. Aggregate evidence presented by Grossman and Krueger (1995) suggests that the relationship between economic development and environmental degradation is not linear. In fact, they suggest that if a correlation exists, the relationship may be an inverse one, at least at higher levels of income per caput. Lucas (1996) also concluded that, while the empirical relationships are far from simple, there is not a monotonic increasing relationship between standards of living and various measures of environmental quality. Arrow et al. (1995) also urge caution in the interpretation of the available empirical evidence on the relationship between economic growth and environmental quality.

We are concerned with the relationship between trade and the environment at a less aggregate level. In particular, we are concerned with the effects of the URA and of the NAFTA on environmental quality through the effects of those treaties on the livestock and grain industries of North American agriculture. Trade liberalization can affect production and consumption decisions for agricultural commodities in numerous ways. These decisions can result in mixed effects on environmental quality. A comprehensive and balanced approach is required to ensure that all of the important positive and negative effects of trade liberalization are considered in any environmental analysis of a trade agreement. Focus on one class of effects at the expense of the other has often lead to avoidable controversy.

The primary focus of trade liberalization[3] negotiations has been the reduction of tariffs and, to a lesser extent, quantitative restrictions on imports and exports. The reduction of tariffs has three primary effects. First, consumers face lower prices than they otherwise would. As long as demand for the relevant product is not completely inelastic, we would expect consumption to increase. A second effect of tariff reductions is to reduce the product and input prices received by domestic producers. Unless supply is completely inelastic, we would expect domestic producers to produce less after a reduction in tariffs on outputs and to produce more after a reduction in tariffs on inputs. The net effect of a simultaneous reduction in tariffs on inputs and outputs is therefore ambiguous. The third effect, and this is usually ignored, is the impact on government revenues. Unless a Laffer Curve effect is observed, we would expect a reduction in tariffs to decrease government revenues. Determining the effects of this fiscal impact on resource use in agriculture is clearly a complex undertaking. If revenues lost from tariffs are replaced by income, sales or other domestic taxes, then the effect on economic output depends on the incidence of those taxes relative to the tariffs they replace. Alternatively, lost revenues could lead to reduced government expenditures.

Environmental Implications

The environmental implications of these three effects are complex. A fall in product prices received by domestic producers can have two effects. First, it can lead to a contraction of the extensive margin of production. Economically marginal land that was in production at the artificially high prices sustained by tariff protection will become extramarginal. This extramarginal land will tend to move to its next highest valued use outside agriculture. If that use is forestry, recreation or abandonment, this can lead to an improvement in environmental quality if those activities are more conducive to the maintenance of wildlife habitat and water and air quality than the agriculture that they replace. But this land use conversion may benefit some species that are less well adapted to the modified ecosystem under agriculture and be a setback for those species that did well in that agricultural ecosystem. So even at this basic level, the environmental effects of trade liberalization are equivocal. And agricultural land use may maintain physical infrastructure that slows erosion relative to what would occur should agricultural land be abandoned. In these instances, surface water quality may be degraded by eroded sediment when that infrastructure, in the form of terraces and canals, falls into disrepair.

The reduction of prices received by domestic producers can also have an impact on the intensive margin of production. Falling output prices, often accompanied by increasing input prices as input subsidies are also reduced or abandoned as part of a trade agreement, creates an incentive for domestic producers to apply fewer inputs per unit of land than they otherwise would. To the extent that these inputs have been applied in amounts that exceed the absorptive capacity of the land and the plants which are grown on it, they can be a contributing factor to degradation

[3]The discussion that follows is based on the conditions that typically prevail in developed country agricultures; that domestic policies favor domestic producers and the expense of consumers and taxpayers.

of ground and surface water quality. Under these circumstances, reduced input intensity can shrink the environmental footprint of agriculture. Of course, reductions in tariffs on inputs would act generally in the opposite direction as reductions in tariffs on outputs[4].

It is important to remember, however, that the adjustments in resource use in agriculture that occur in response to a trade treaty are the joint products of the terms of that treaty **and** domestic environmental programs such as land set-asides, restrictions on land use and fertilizer applications to protect groundwater or surface water, local zoning regulations that limit the expansion of livestock facilities, domestic pesticide regulations and other resource conservation policies. These measures, at least initially, could constitute constraints on changes in agricultural production in the wake of a trade treaty. Moreover, the existence of a such a treaty can create pressures for policy change in these areas. For example, non-targeted soil conservation payments to producers might attract only limited international attention in the absence of a trade treaty, but they become a potentially contentious issue when the terms of that treaty permit payments to farmers only in the pursuit of a "legitimate" environmental measure by "cost effective" means.

Some environmental critics of trade liberalization have been quick to point out, however, that reduced domestic production and increased domestic consumption lead to increased international trade and that trade must be transported from exporting countries to importers. This transportation consumes resources and releases emissions into the atmosphere and into waterways. This increased pressure on air and water should be acknowledged as part of the consequences of trade liberalization (Gabel, 1994). There are important qualifications to this effect, however. Intranational transportation is not always less environmentally burdensome than international transportation. Canadian trade and transportation policies have been closely linked since the "National Policy" of the MacDonald government shortly after Confederation in 1867. The aim of this policy was to promote east-west transportation and interprovincial trade within the fledgling Canadian confederation of provinces at the expense of north-south trade with the United States. To the extent that this policy was successful, it increased the distance over which goods were transported within Canada and, for that matter, within North America. This example illustrates the possibility that trade liberalization can actually lead to shorter distances traveled by commodities.

Trade liberalization generally has more sweeping implications than the reduction of tariffs and the relaxation of quantitative restrictions of imports and exports. Signatories to a trade treaty may agree to forgo the use of certain classes of policies, for example export subsidies, as well as to reduce tariffs and increase quotas. Or some policies may be abandoned because they become prohibitively expensive under more liberal trade. The NAFTA and the URA also contained provisions to

[4]To complete the taxonomy that we introduced earlier, relaxation of import quotas on outputs or inputs would tend to reduce domestic producer prices. Trade liberalization in agriculture usually also involves the application of a set of criteria that rules certain types of input or output subsidies as "illegal" under the terms of the treaty.

harmonize or otherwise render compatible national technical and environmental regulations. Regulatory harmonization has proven to be one of the most worrisome concerns to environmental critics of GATT and the NAFTA. It was arguably the potential for the so-called "race to the bottom" as the outcome of regulatory competition among Mexico, Canada and the United States that lead to the signing of the NAAEC concurrently with the ratification of the NAFTA itself. Lindsey and Bohman, at last year's meeting of this group, clearly laid out the trade economists' case against a Procrustean homogenization of technical standards and environmental regulations among trading partners, particularly among trading partners at disparate levels of economic development. The case, however, continues to be a hard sell outside the confines of the community of trade analysts and negotiators. Later in this paper, we outline reasons that might give economists pause in their criticism of harmonization.

The linkages between the terms of a trade treaty and the effects of those terms on patterns of production and consumption within the domestic economies of the signatories to that treaty and on intra and international trade in commodities affected by that treaty are complex. No less complex are the linkages between those changes in production, consumption, transportation and trade and the various dimensions of environmental quality. The quantitative literature on the effects of the NAFTA or the URA on Agriculture specifically investigating the likely effects of the actual content of those agreements is not voluminous. Many studies[5] were conducted while the treaty negotiations were in progress.

Different possible levels of liberalization were modeled before it was yet clear how much substantive progress would be made on the liberalization of agricultural trade in either of those agreements. The general finding of this research effort is that the aggregate effect of even a radical, almost complete, liberalization of agricultural trade relations would be modest. Anderson and Strutt (1996) report that the aggregate effect of such a hypothetical liberalization on global grain and livestock production would be negligible. A small[6] relocation of production away from the most protectionist high income countries to low income countries, for whom trade liberalization would amount to a cessation of punitive trade treatment of their agricultural economies, and to some of the less protectionist developed economies, was anticipated. But describing the regional changes in production in terms of high income and low income countries masks an important effect of this hypothetical radical liberalization. Various results reported by Tyers and Anderson (1992) indicate that agricultural output under radical liberalization would fall by as little as 10 percent to as much as 50 percent in Japan and in the European Community. The environmental importance of this adjustment follows from the fact that the agricultural economies of these regions are currently among the most input intensive in the world. High producer prices have encouraged farmers in these countries to apply

[5]See Anderson and Strutt (1996) for an overview of this literature.

[6]Anderson and Strutt indicate a 5 to 6 percent reduction in production in the industrialized countries, primarily Japan and western Europe, partially offset by increases in North America and Australia and New Zealand, and an increase in production in low income countries on the order of 3 to 8 percent.

more plant nutrients, plant protection products and animal units to each unit of land. In our judgement, it is no coincidence that environmental concerns regarding agricultural emissions are acute in these countries.

So, potentially at least, agricultural trade liberalization could produce an environmental dividend. Decreasing input intensive agricultural production in high income densely populated countries that have been strongly protectionist toward their agricultural industries and increasing more input extensive production in more sparsely populated countries could result in a less environmentally invasive world agriculture. Of course, an important qualification of this generalization is that the net environmental effects of liberalization will also depend on the environmental policies and institutions in place in the countries where production expands that will shape the specific resource use adjustments that take place.

Evidence on Mexico

The actual level of liberalization achieved in agricultural trade relations in the Uruguay Round or in the NAFTA was far from radical. And the less liberalization actually achieved, the smaller will be the environmental dividend gained. Beghin et al. (1997) have recently published the results of a major study of the environmental effects of the NAFTA in Mexican agriculture. They used[7] a general equilibrium approach in which Mexican agriculture was disaggregated into 22 agricultural and 14 related processing industries. Thirteen categories of agricultural emissions were considered in the model, but only chemical contamination of soils and water and NO_2 and SO_2 were analyzed in the three policy scenarios. Results were obtained for the case of domestic environmental policy reform in Mexico, the case of trade liberalization under the URA and the NAFTA alone, and finally the case of the coordinated domestic environmental policy reform and trade liberalization. An important feature of the model used in this study was its capacity to allow for adjustments in the input mix employed in agriculture in response to changes in either trade or environmental policies, rather than allowing only changes in total output with fixed input-output combinations. Emissions were modeled as a function of inputs used, not output produced. Environmental policy reform was modeled as the application of emission taxes on outputs. The emission taxes modeled in this study were hypothetical because, as far as we know, no such taxes are used in Mexico, Canada, or the United States, or in other OECD countries for agriculture. Taxes were levied on producers in proportion to the inputs used in production and to the emissions assumed to be generated from the use of those inputs. In our view, the model's focus on inputs is essential if modeling is to capture the intranational effects of policy change that are often most important from an environmental point of view.

Studies such as Beghin et al. are useful as preliminary indicators of environmental effects, but a growing body of literature indicates that local variations in climate, topography, geology, hydrology and ecology are critical factors influencing

[7]This analysis employed the OECD's Trade and Equilibrium Analysis (TEQUILA) general equilibrium model of the Mexican economy.

the severity of environmental problems associated with production activities and also the effectiveness of different measures that might be employed to address these problems. Antle, et al. argue that the level of aggregation embodied in most CGE models does not have enough resolution to identify these local effects. Consequently, these models give us little insight about the real environmental effects that will ensue, just aggregate loadings. We agree and suggest that these exercises are most useful for judging general directions of change and orders of magnitude.[8]

Beghin et al. report that the imposition of effluent taxes on Mexican agriculture would reduce aggregate output of the sector by a little less than 5 percent. Much of this reduction is concentrated in the food grains sectors that have traditionally received a high level of protection under Mexican agricultural policy. The trade liberalization scenario is modeled as a gradual elimination of tariffs by the year 2010 coupled with a 10 percent increase in world commodity prices over the same time period, presumably as a consequence of liberalization in the rest of the world. Once again, production of the major food grains crops, maize, beans and sorghum declines under this scenario. Imports of these grains, as well as wheat and livestock, increase. Trade liberalization is accompanied by environmental improvements as the overall level of agricultural output declines, but some paradoxes are observed. For example, hog production falls under trade liberalization, but NO_2 emissions increase, presumably as a result of changes in rations brought about by increased availability of imported feed grains.

To our knowledge, there has not been any empirical analysis of the U.S. or Canadian agricultural economies to parallel the Beghin et al. study. Perhaps this group should coordinate research in this area. This is an ambitious undertaking. Many writers have suggested that more effective integration of trade and environmental policies will turn out to be a central issue in the next round of multilateral trade negotiations. If they are correct, then both the analytical capacity to study the environmental effects of continued trade liberalization in agriculture and improved empirical analysis of the nature and size of those impacts will soon be needed.

Ultimately, the environmental effects of adjustments in production, distribution, processing, retailing and consumption in response to a trade treaty are site specific. Local climate, geology, distribution of biota and hydrology can make resource adjustments that are ecologically benign in one context yet harmful in another. We would hasten to add that this observation in itself should not be used as an excuse to delay efforts at trade liberalization until more complete baseline data and analytical methods are available to enable us to identify site-specific risk factors. Since trade liberalization has the effect of reducing environmental pressure in some places and increasing it in others, delaying the process of liberalization merely prolongs the environmental damage inflicted by agricultural policies that have artificially encouraged agricultural production as the extensive and intensive margins.

[8]On the other hand, the cost of the large number of highly disaggregated studies that would be needed to investigate the local environmental consequences of the NAFTA throughout the North American agricultural economy would be enormous.

By the same token, the uncertainty should not delay putting environmental policies in place to guard against reasonably certain cases of increased environmental pressure, such as along border zones.

EFFECTS OF ENVIRONMENTAL REGULATION

North American farmers fear that environmental programs hurt their ability to compete in global markets in two ways. First, if domestic environmental programs impose strong standards or restrict the use of key inputs in production, their costs will rise. The ultimate effects on trade depend on the size and duration of the cost increase, and any changes in the *ceteris paribus* conditions. Second, if foreign nations guard against perceived environmental risks from imports by requiring certain product or product-related process characteristics, market access will be restricted. An example is a restriction on grain shipments for phytosanitary reasons. The significance of such restrictions depends upon their scope and the firmness of enforcement.

Concern about the trade effects of environmental programs is relatively new to agriculture, but not to other industries (Pearson, 1993). National air, water and land quality programs approved in the 1970s required firms outside production agriculture to reduce pollution, mostly by adopting specified technologies. Government and business leaders voiced fear about maintaining trade competitiveness in the face of added compliance costs. They felt that countries with lower environmental standards would capture a greater share of trade markets, and even attract some domestic firms. By and large, their fears have not materialized. We explain the reasons below, and can learn from them to inform the emergent debate in agriculture.

The issue of whether environmental programs affect trade competitiveness should be posed as "How can a country maximize welfare from its choices of domestic production and consumption, of trade, and of environmental management?" Perhaps Kym Anderson (1996, p. 44, emphasis added) has answered this question most clearly "… the fundamental point remains that free trade is nationally and globally superior to no trade **so long as the optimal pollution tax is in place**." There are many caveats to this conclusion, but the principle is clear. Both open trade and optimal environmental management are requisite to maximizing national and global economic welfare. If the conclusion that liberalized trade improves welfare is to hold, environmental shadow prices must be included in the decision calculus throughout liberalization (Ervin, 1997). Hence, programs that internalize the external environmental costs and benefits of farming and ranching are needed.

What constitutes an "optimal" pollution control program requires further comment. In theory, we know that such a program will push pollution control to the point where the present value of the stream of benefits from avoided damages just equals the present value of the stream of marginal benefits from avoided damages. However, measuring the benefits of environmental improvement is often difficult or impossible because of missing current market prices, let alone forecasting future values. This relegates the optimal decision rule to the classroom for many environmental management problems. In its place, the choice of an "optimal" approach is

left to the judgement of duly elected politicians or responsible public officials who may consider available economic and other evidence. In practice, this often boils down to establishing physical or biological standards, such as the maximum permissible concentration of water pollution in a stream based on known or suspected health risks, and then finding the most cost-effective approach to achieve those standards. Is this in any sense "optimal"? Perhaps, if we can be assured that the decision-makers weigh all available evidence and accurately represent the public's preferences. These difficulties may explain why Anderson (1996) opts for the requirement of "something approaching an optimal tax" rather than strict optimality. It may also explain why the URA did not impose stronger conditions on the legitimacy of agri-environmental programs explained below.

Studies of other industries have found remarkably little evidence of trade and industrial location effects due to environmental regulations. The main approach has been to analyze the relationships between trade flows and pollution abatement costs (PAC). PAC comprise a small share of an industry's costs (on average less than 2.0 percent), but vary considerably over sectors (OECD, 1993). Moreover, differences in PAC between countries have declined over time. Comprehensive reviews conclude that compliance costs have caused insignificant output reductions on average, and show little if any evidence of any significant trade impacts (Dean, 1992). The lack of significant effects may reflect a host of offsetting influences, e.g., similar environmental programs across competing exporters, exchange rate forces, and management and technology innovations.

If production costs rise sufficiently from environmental regulation, some firms may migrate to countries with lower standards. This is the well known "pollution haven" hypothesis that "dirty" firms will move abroad to avoid heavy compliance costs. Their movement may reflect an intentional economic change because the industry creates large environmental damages. Theoretically, if the countries charge for significant environmental costs and compensate for significant benefits left out of market prices, then such a move can leave both countries better off. But concluding that the shifts improve global economic welfare depends on whether sufficient policies have been implemented at home and abroad. Studies have found scant evidence that PAC have affected industrial location decisions (Leonard, 1988; Dean, 1992). Firms base their location decisions on a variety of factors, including labor productivity, infrastructure, transportation costs, and other factors. If abatement costs are relatively small, then the incentive to reduce these costs by relocating is small as well.

Two important qualifications apply to the conclusion of insignificant trade and relocation effects by environmental regulation. First, some industries spend very different amounts on pollution control and face considerably different degrees of competition. Analyses of aggregate trade flows may miss specific effects on high PAC sectors that become apparent in more detailed studies. High-cost sectors may suffer from unfavorable pairwise differences with their competing exporters. Even small amounts may be important in increasingly competitive international markets under trade liberalization. Second, the studies are backward looking by necessity, and

subsectors that anticipate strengthened environmental requirements require careful monitoring. Given the extensive use of land and water by agriculture and a trend to more direct controls, close scrutiny appears warranted.

Most developed countries pursue a similar set of environmental objectives for agriculture, including reduced water pollution, soil erosion control, wildlife habitat protection, and landscape preservation, albeit with differing priorities and approaches (OTA, 1995). The United States predominantly uses voluntary-payment schemes.[9] The programs often combine education to identify problems, technical assistance to install recommended practices, and cost-sharing to defray a portion of the expense of implementing a practice. Another approach is to make rental payments to retire cropland from production temporarily. No other U.S. industry is offered the wide array of voluntary-payment programs for environmental management that are offered to agriculture.

With the exception of the short-lived Lower Inventories For Tomorrow (LIFT) program in the 1970s, Canada has not used land set-asides as a central instrument of agricultural resource policy. In part, the export orientation of the Canadian grain industry makes this policy approach unattractive. There is no comprehensive national environmental agricultural policy process in Canada. The federal Farm Income Protection Act of 1991 represented a limited step in this direction. The Act required an environmental analysis[10] of all new federal agricultural policies and programs and a periodic environmental review of existing programs. Analyses were conducted for the Gross Revenue Insurance Program (GRIP) and for the Net Income Stabilization Accounts (NISA) (Environmental Management Associates, 1993) as well as for the national crop insurance program (Von Massow and Fox) but we are not aware of any more recent studies. Other Canadian agriculturally related environmental programs have taken the form of cost sharing non-targeted voluntary initiatives. A case in point is the Soil and Water Environmental Enhancement Program (SWEEP). This program consisted of research, demonstration projects, information distribution and producer assistance directed at reducing the rate of sediment and phosphorous deposition from agricultural sources into the Great Lakes, primarily Lake Erie. Mexico possesses the authority to pursue direct controls in agro-environmental management under the 1988 General Ecology Law. While this broad authority exists, it is unclear to what extent the provisions have been implemented.

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[9]Payments for environmental management were sanctioned in the Uruguay Round Agreement on Agriculture under two conditions: (1) they are applied as part of a clearly defined government program to fulfill specific conditions, and (2) the payment amount cannot exceed the cost of the management practice of the loss in income associated with program compliance (Annex 2). Known as the "Green Box" conditions, they are part but not all of the requirements to ensure that subsidies do not cause trade distortions. In addition, the subsidies should be provided only in cases where the expected benefits of environmental improvement outweigh the anticipated costs. Also, the subsidies should be structured to stimulate producer and R&D innovations that minimize long-term compliance costs. If the subsidy does not satisfy these conditions, it can attract capital to the industry, enlarge supplies, and may aggravate environmental problems. Agro-environmental subsidies in the U.S. generally have not met the minimum compensation and incentive-compatibility requirements (OTA).

[10]The Act did *not* require an environmental assessment, which is a formal quasi-judicial process in Canada. The environmental analysis indicated in the Act is *ad hoc*.

The dominance of voluntary programs implies that North American farmers generally hold de jure or de facto rights to dispose of wastes into streams and other environmental media (Bromley, 1997). The extensive use of payments reflects that farmers require compensation for any diminution of those rights. Defining cost responsibility in favor of producers likely stems from the special political status given agriculture in developed nations. It also affects the technical difficulty an economic cost of implementing regulations to control diffuse sources of pollution that can not be readily traced to their sources over such a large land base and from millions of diverse production units, i.e., nonpoint pollution.

Some compulsory environmental programs apply to North American agriculture. Not strictly regulation, the United States has compliance schemes that require farmers participating in other agricultural programs to meet minimum conservation standards or risk losing the program payments. Each country regulates the introduction and use of pesticides. Generally, human and environmental risks from pesticides are controlled by registering only those compounds deemed to be without excessive risk from application or through food, water or air exposure. Some programs also regulate the alteration of lands that would cause environmental loss. For example, conversion or drainage of certain wetlands and endangered species habitat in the United States is regulated. Finally, large confined animal facilities generally are subject to permits issued by federal, state and local governments that specify required waste control technologies and / or maximum effluent.

How has this mix of programs affected trade competitiveness? The general hypothesis is clear—the trade effects should be negligible, given the dominance of voluntary-payment programs. The U.S. government spends about $3.5 billion per year on such programs, most of which goes for land rental payments, cost-sharing, and education / technical assistance (USDA-ERS). These programs do not exert competitiveness drag on **individual** farms and ranches. The effect on industry supply may indeed be significant as discussed below for set aside. The effects of the regulatory programs also appear modest. Assessments have shown that U.S. pesticide regulation has not caused significant economic loss for the farm sector (Osteen and Szmedra, 1989). Deen and Fox as well as Deen and McEwen have argued that while Canadian farmers often lament perceived disadvantages in access to pest control inputs relative to their U.S. counterparts, the actual effects on competitiveness are not large.† Comprehensive estimates of the effects of US regulations on confined animal facilities, wetlands alteration, and endangered species protection on competitiveness have not been made. However, a survey of assessments of those programs through the early 1990s suggested that the wetlands and endangered species programs had not affected broad segments of U.S. farms and ranches, and the confined animal facility regulations were unevenly and weakly enforced by states (OTA, 1995, pp. 97-98).

†Editor's note: Several surveys have shown that Canadian farm chemical prices are no higher (or lower) than those in the U.S., exchange rate effects included.

Formal tests of the competitiveness hypothesis are fraught with difficulty. Data on pollution control costs are not collected and reported for agriculture, unlike other industries. Statistical analysis also has proven difficult because of missing data on the **net** costs of the programs. Looking at payments as well as costs is important because past programs have made substantial transfers into agriculture in many countries (Paden, 1994). Those subsidies may have boosted production and trade, especially when coupled with production and export subsidies.

Tobey (1991) estimated the potential for different crops to generate pollution and correlated the estimates with the revealed comparative advantage of crops in the world market. He found that the crops that perform well in world markets also have the largest pollution potential. Therefore, stringent programs to control that pollution could affect their trade advantage. He concluded, however, that trade competitiveness losses are likely to be modest for three reasons. First, most competing exporters have introduced similar agro-environmental programs. Second, developing countries do not hold large market shares in most of the commodities, such that uneven environmental requirements will greatly affect trade. Finally, any competitiveness effects will likely be swamped by larger forces such as exchange rates.

Some trends raise the concern that production and trade may be increasingly affected. There is a distinct chance that conservation subsidies may rise in the form of green payments as production and export subsidies are diminished. Environmental subsidies do not necessarily distort trade as explained above. However, in practice, subsidy programs often depart from the optimal conditions. Also, there appears to be a trend toward environmental policies with more cost responsibility for farms and ranches. In the United States, 30 states have passed laws that authorize enforceable measures for farm water pollution, most during the last decade (Ribaudo, 1997). The trend is for more direct controls.

The potential for greater effects exists because of the industry's extensive use of land and water. Two programs illustrate that potential. The first is land set-aside for environmental purposes. A 1995 study estimated significant trade gains from downsizing the U.S. Conservation Reserve Program (CRP), and few environmental losses (Abel, Daft, and Earley). Retirement of up to 14.75 million hectares in the CRP was reauthorized by the Federal Agriculture Improvement and Reform (FAIR) Act of 1996. Current enrollment stands at about 12 million hectares. It is unclear at this point how much more land will be retired. The USDA implemented an improved environmental benefits index and rules against paying rents in excess of market rates to help avoid retirements without net benefits. These reforms bring the CRP more in line with the URA requirements for environmental payments. Absent the support programs that previously boosted production, set aside now is more likely to be a binding constraint on production. However, it is possible that some enrollments are simply retiring cropland at the extensive margin that was brought into production under previous programs.†

†Editor's note: See the discussion of CRP in the Young and Adams paper in this publication.

The second is controls on pesticides. Major reform of U.S. pesticide programs was approved in the 1996 Food Quality Protection Act (FQPA) which will involve the re-registration of most compounds. The potential exists that many current pesticides will lose their registration. Concern by U.S. farmers emerges about maintaining trade competitiveness under the tighter controls. American agriculture is heavily reliant on these inputs. For example in 1995, 324 million pounds of active ingredients (a.i.) of herbicides, 70 million pounds (a.i.) of insecticides, 45 million pounds (a.i.) of fungicides, and 127 million pounds (a.i.) of other pesticides were estimated to be applied on cropland growing major U.S. crops (USDA, ERS, 1997). The total of 566 million pounds of a.i. compares to 215 million pounds in 1964. Herbicide use on corn grew from 26 million pounds (a.i.) in 1964 to 210 million pounds (a.i.) in 1991, and on soybeans from 4 to 70 million pounds (a.i.). Although acute toxicity risk has risen over the period, analysis shows that a chronic toxicity index has declined due to less persistence in the environment of newer compounds (USDA-ERS).

Two tentative findings emerge about the effects of agro-environmental programs on trade. First, current programs mostly cause negligible effects. U.S. set-aside programs are the major exception. Their effects on grain production and trade are likely significant. Their potential to cause welfare losses or gains depends on the rules used to enroll the lands. Second, future agro-environmental programs will enlarge the potential for trade effects. Restrictions on pesticide use and tighter controls on wastes from large confined animal facilities are notable. Any trade distortions from these restrictions depend on the specific programs adopted.

ENVIRONMENTAL TRADE MEASURES (ETMS)

Article XX of the GATT provides for two general exceptions from a country's GATT obligations that permit a country to institute measures related to environmental management:

Article XX(b) provides an exception for measures "necessary to protect human, animal or plant life or health"; and

Article XX(g) provides an exception for measures "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption."

An application of either exception generally comes in the form of a product standard, such as the amount of pesticide residue or the presence of unwanted insects on imported foods. Countries also use product-related process standards, such as the satisfaction of processing sanitary conditions.

Technically, the regulation is on the product, but it relates to the process of production. Controversy surrounds the use of process standards for environmental purposes. The exceptions legitimize country actions to protect their natural resources

from trade-related risks. Nonetheless, fears of a proliferation of environmental non-tariff trade barriers abound (Runge). Article XX actions must avoid unnecessary trade interference, such as unequal treatment of imports and domestic production.

Esty (1994) believes that the exceptions provide an insufficient basis for environmental management. His main reasons are the restrictions on "process" approaches since environmental effects largely derive from the production process rather than products, and the proscription on unilateral actions when multilateral environmental organizations are absent. Despite these concerns, tens of thousands of country actions to protect plant and animal health have been implemented and several international environmental agreements operate, with few GATT challenges to date. The apparent incongruity may be one of "the glass is half-empty, or the glass is half-full". Whether the existing mechanisms are sufficient to address modern environmental transboundary issues is the point of contention.

The URA added two new agreements related to environmental management—Sanitary and Phytosanitary (SPS) Measures and the Technical Barriers to Trade (TBT). SPS issues currently have the larger potential to affect agricultural trade. The SPS agreement sets out conditions under which sanitary and phytosanitary measures can be used to protect human, animal or plant health. Specific examples include inspection, certification and approval procedures, quarantine treatments, and the establishment of pesticide tolerances. The apparent driving forces for passing the new SPS agreement were food safety concerns and avoidance of unscientific measures that restrict food exports. Nonetheless, the SPS measures include animal and plant life and health, and therefore pertain to the natural environment.

How might the SPS Agreement affect the grain-livestock sector? One of the largest environmental risks of liberalized agricultural trade is opening new pathways for the importation of harmful non-indigenous species (HNIS). Over half of the weeds and 40 percent of the insect pests affecting U.S. agriculture and forestry are estimated to be non-indigenous. Prominent examples include the Russian wheat aphid, and 50 to 75 percent of major U.S. weeds that cause extensive damage to public and private lands. Jenkins notes that approximately 80 percent of the harmful new exotics detected from 1980 to 1993 in the United States were unintentional imports through trade. The costs of HNIS in the United States have been significant (OTA, 1993). Cumulative economic damage from 1906 to 1991 caused by 79 NIS organisms or species cases, less than 14 percent of the total, was estimated at $97 billion (1991$). Losses due to exotic agricultural weeds could not be included.

The SPS code pertains to HNIS cases. The code sanctions the use of quarantines, for example, to minimize harmful introductions. The United States has invoked this provision on a number of occasions: for example, to ban seed potatoes from Canada. Such actions may be viewed as disguised barriers to trade, and open to challenge under GATT rules. The GATT has rarely been used for such challenges, as noted above. Article XX establishes a nation's right to establish its own rules and regulations regarding human, animal, and plant health (which cover NIS).

Despite abundant fears, there is little evidence to document environmental technical barriers. One survey analyzed the impact of environmental standards on the exports of southern U.S. commodities (Marchant and Ballenger, 1994). Their findings did not reveal extensive trade effects from current domestic or foreign environmental actions, with the exception of the scheduled phase out of methyl bromide. Comprehensive assessment of technical barriers to U.S. agricultural exports is underway (Roberts and DeRemer, 1997). Technical barriers in this analysis encompass all product or product-related process standards that impede U.S. exports regardless of their legality vis-à-vis GATT rules. Therefore, they could include transparent violations of existing SPS and TBT codes, legitimate applications of the codes (e.g., to protect open access resources), or applications of product and process standards that have questionable legitimacy. The authors report an extensive survey of USDA field staff and representatives of producer groups who identified approximately 300 "questionable" measures in 63 foreign markets, and estimated that the technical barriers threatened, constrained, or blocked nearly $5 billion in 1996 U.S. exports.

The "questionable" barriers were unevenly distributed by value of impact, by region, and by purpose. The estimated trade impact (loss in producer gross sales revenue) was under $10 million for 70 percent of the barriers. On the other hand, just 20 barriers accounted for over 60 percent of the total impact. East Asian and the Americas countries led other regions in barriers. About 60 percent of the impact was attributable to measures that affected market expansion, followed by market retention, and then market access. Over 90 percent of the issues are SPS applications, and the remainder are other technical barriers. The barriers generally mirrored the broad pattern of trade flows for U.S. agricultural products. Although the survey was only the first step in a larger assessment, it suggests that technical barriers materially affect U.S. agricultural trade. The vast majority of barriers pertain to private natural resources, e.g., orchards, and not to open access environmental resources.

INCORPORATING ENVIRONMENTAL PROVISIONS IN TRADE AGREEMENTS: LESSONS FROM RECENT EXPERIENCE

There is increasing international interest in the integration of agricultural trade and related environmental protection measures[11]. Calls for integration by trade negotiators and trade policy analysts tend to be animated by concerns that environmental policies might become the next generation of protectionism (Runge). Both the GATT and the NAFTA have come under fire from environmental policy analysts for not having achieved an appropriate level of integration of environmental and trade policy concerns. Calls for integration from environmentalists have primarily been concerned with trade based on a false comparative advantage when production of a traded commodity degrades some environmental value and this cost is not adequately reflected in the price of the traded good[12] (Paden, 1994). As a result of these

[11]Recent work by the OECD (1993) and the agenda of this workshop are evidence of the growing interest in this topic.

competing perspectives and motivations, it is not always clear what purpose advocates of policy integration have in mind. The process of integration of trade policy and environmental policy is just beginning. There are reasons to believe that the NAFTA represents an improvement over the GATT in this respect, however trilateral support for the Commission for Environmental Cooperation has not been strong, indicating that the practical commitment to integration may not be as strong as some would like it to be. It remains an open question whether policy integration at the international level is best achieved within a multilateral trade organization, like the WTO, or with a parallel independent multilateral environmental organization, a WEO.

Our view is that trade treaties should ensure that trade is taking place under conditions in which the appropriate costs of external effects of production and consumption are internalized (taken into account) by producers, and consumers so that trade is not being distorted by environmental subsidies and that national measures taken to achieve such internalization are not disguised ways of protecting domestic producers from foreign competition. This purpose is clearly easier to state conceptually than operationally. What do we mean by internalization of appropriate costs? The economists concept of externality has been stretched to the point that it cannot help us draw the relevant boundaries. It has come to mean any instance of human action that generates harmful or beneficial effects for someone who is not party to the action or market exchange that originated those effects. Not all such harmful interdependence needs to be internalized before trade could be considered free of environmental subsidies[13].

Does the requirement that trade not be implicitly supported by environmental subsidy require that "free trade" satisfy the requirements of sustainability (as suggested by Paden and by Common and Perrings) that is, are intergenerational environmental subsidies out of bounds as well as the more commonly considered third party costs associated with air and water pollution? Is it necessary to internalize all third party costs, or only those that are worth doing, in the sense articulated by Demsetz and Dahlman?

Regardless of how these conceptual issues are resolved, several practical resource related issues, in our judgement, are emerging in the trade and environment area that have important implications for the grains and livestock industries of North American agriculture. These include the following.

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[12]This is sometimes referred to as an environmental subsidy, implying that some natural or environmental resource is being employed in the production of a traded commodity, but that the opportunity cost of that resource is not accurately reflected in the price at which that good is traded. Trade analysts, however, use the term "environmental subsidy" as we used it earlier, to refer to a payment by government to farmers in exchange for farmers providing some type of environmental service, for example, maintaining endangered species habitat on their land. These are clearly different ideas. This difference is but another illustration of the difficulties involved in building bridges of communication between the constituencies of trade and environmental policies.

[13]In the sense that this term is used by Paden (1996).

Full Cost Pricing of Irrigation Water. Irrigation water is becoming an increasingly scarce resource in Mexico, as well as the western United States and Canada. Farmers have rarely paid the full cost of providing this water. Increasingly, however, the environmental costs of reservoir and canal or pipeline construction and the alternative in situ and consumptive uses, especially urban consumptive uses, are being raised. Determining the level of subsidization of irrigation water costs for farmers is controversial and the stakes are high.

Full Cost Pricing of Grazing on Government Owned Lands. Few issues in agricultural policy in the United States, and to a growing extent in western Canada, are as explosive as grazing fees on federal lands. There are shreds of evidence that grazing fees in the United States and Canada are less than those that would prevail if those lands were privately owned and the fees were negotiated as market exchange prices. But the size of the difference between fees that would prevail under those circumstances and current fees is difficult to determine. And the potential countervail issue is the difference between the differences.

Full Cost Pricing of Transportation Services. Grain transportation off the Prairie provinces in Canada as well as through the combination of rail, truck and barge in the midwestern United States, historically has been fraught with implicit and explicit transportation subsidies. These subsidies have played a pivotal role in the evolution of the development of the continental grain transportation infrastructure. This in turn has influenced the location of production and processing activities. The current environmental footprint of the grain industries, and indirectly through feedgrains of the livestock feeding and finishing industries, reflects this history of subsidization. In Canada, the demise of the Crow Rates and their descendants is already being acknowledged as an important factor in the regional transformation of livestock feeding and meat processing at a national level. In the United States, water transport of grains raises the issue of watershed management, water use, and the full cost pricing of water used in transportation as well as irrigation.

Compensation of Landowners for Regulatory Takings Regarding the Protection of Endangered and Threatened Species. Policies to protect endangered species, wetlands and other natural areas differ substantially between Canada and the United States (Ivy, 1996) and even more so between Mexico and its NAFTA partners. The issue of compensation of land owners for restrictions on land use to preserve wetlands or to protect threatened and endangered species is being raised with increasing frequency in the United States and Canada (Fox, 1998). To the extent that emerging compensation practices differ between the two countries, they could be seen as an unfair competitive advantage.

Reform of U.S. Conservation Reserve Programs. The available evidence indicates that expenditures under various conservation provisions of U.S. farm bill legislation has been, to put it mildly, not closely correlated with the achievement of environmental objectives. It is not easy to define the criteria for targeted environmental programs. But Fox et al. (1995) have argued that there needs to be a clear contribution of erosion to off-site water quality problems before government action is justified. If we

accept this argument, then there is room for considerable improvement in U.S. soil conservation policy. The current level and distribution of expenditures would be hard to justify as a cost effective means of attaining a legitimate environmental objective, making them potentially vulnerable under URA provisions (see footnote 9).

Cross Border Water Pollution Problems, especially on the Mexico/U.S. border. As part of the environmental side-agreement of the NAFTA, the North American Accord for Environmental Cooperation, Mexico and the U.S. agreed to establish a special initiative to reduce water pollution crossing their borders. Early progress on these issues however, has been disappointing.

Domestic Water Quality Problems from Agricultural Emissions. In the developed economies, agriculture is one of the last sectors to have come under legislative and regulatory scrutiny for air and water borne emissions. The exclusion of agriculture from the process of regulatory oversight is usually attributed to agricultural emissions being characterized as "non-point" sources. But this term fails to adequately convey the nature of the problem of mitigating agricultural emissions. All emissions come from somewhere, from some "point". The problem with agricultural emissions can best be explained in terms of the costs of information. National or even regional regulatory agencies face a daunting task in obtaining information about the location of agricultural emission sources. These sources are numerous and are spread out over large areas. And emissions from most agricultural sources are seasonal or episodic. There is not a continuous regular flow of displaced sediment from crop land to adjacent water bodies. Sediment transport occurs contingent on weather events and the extent to which topsoil is exposed during these events. Similarly, livestock manure ends up in streams when storage facilities overflow, when grazing cattle obtain access to stream banks or when manure is misapplied. These are not continuous repetitive processes like many industrial or municipal emission processes. Consequently, it is often more costly to identify the points at which agricultural emissions originate. And this makes it more costly to trace the transport and fate of those emissions.

Perhaps, in light of the relative risks associated with agricultural emissions and the cost of obtaining better information about their origins, transport and fate, it has made sense to leave agricultural emissions until near the end of the regulatory process. In any case, baseline data for agricultural emissions in Canada and the United States have not been readily available. But this is changing rapidly. For example, the Economic Research Service's (1997) Agricultural Resources and Environmental Indicators provides a comprehensive empirical overview of the relationship between primarily crop production and environmental quality in the United States. While the available data on sources of agricultural emissions and our understanding of the mechanism that distributes these emissions in the environment are still incomplete, both the completeness and quality of these data and our understanding of the relevant mechanisms have progressed substantially in the last 15 years. While there is currently no Canadian counterpart to the ERS's Indicators, important efforts have been made to assess the contribution of agricultural emissions

to the degradation of ground and surface water quality. A major survey of rural groundwater quality was conducted in Ontario in 1992. Harker et al. (1997) reviewed the available evidence on the effects of agricultural activities on water quality in the Prairie Provinces and most recently, Paterson et al. (1998) have reported the findings of a five year study of the impact of agriculture on water quality in the province of Alberta.

Whether these environmental issues will become important in a trade context is difficult to predict. They would only become trade policy issues if they became irritating enough to one of the signatories to the NAFTA for that party to initiate some trade sanction such as a countervailing duty. As mere mortals, we are not in a position to predict that this will happen. We do however, consider each of these areas to be potential trade irritants in the future, and they all represent challenges to more effective integration of trade and environmental policies.

THE ROLES OF INDUSTRY SELF-REGULATION AND INTERNATIONAL AGREEMENTS

Agricultural economists have generally focused on government environmental policy and trade agreements as the primary or even the exclusive means of resolving harmonization and competitiveness issues. An emerging trend in business, however, suggests that the private sector is not waiting for government action to make progress on these complex problems. Apparently, too much is at stake in rapidly expanding global markets. A growing number of private firms are undertaking business-led environmental management programs. Their reasons are diverse, from cost saving by reducing production waste, to avoiding regulatory penalties, to entering lucrative green markets, to ensuring access to global markets; and, their strategies are often aggressive. Most of the early innovators have not been food and fiber production firms. Some agricultural input suppliers have extensive efforts underway, such as Dupont.

Two forces appear to foster business-led environmental management (Batie and Ervin):

- A desire to lower costs and improve profits while achieving or even exceeding environmental compliance standards, i.e., compliance-push forces; and,
- A desire to respond to consumer demands for more environmentally friendly processes and products, i.e., demand pull forces.

A recent example of the “compliance-push” force is the success of the National Pork Producers dialogue on waste management with the U.S. Environmental Protection Agency. The dialogue produced the central strategy for the President’s Clean Water Action Plan to control waste emissions from large confined animal operations. An example of the “demand pull” forces is the large growth rate in “natural” foods produced by farms with organic or other sustainable agriculture technologies. The potential of demand-pull actions to solve complex multi-state or cross-border issues,

such as the Gulf of Mexico hypoxia problem, appears limited. Still, the private approach requires a limited government role, such as setting health standards, and grants broad private flexibility.

One approach that many firms involved in global commerce are eyeing to assist their business-led efforts is ISO 14000. This industry initiative is not designed to aid enforcement of environmental laws or inform the public. Rather, the firm undertakes a series of actions that assure a comprehensive environmental monitoring and management system is in place with independent auditing. Basic elements might include waste disposal processes, energy efficiency, water reuse, and treatment of hazardous wastes. Life-cycle analysis plays a central role in the ISO process. The International Standards Organization facilitates the process and assures that the firm's environmental system is credible. The firm is prohibited from using ISO 14000 status in marketing their products. However, it may be a way of assuring access to certain foreign markets, if those governments recognize the ISO process. The key role of transaction costs surfaces again. ISO 14000 may be particularly attractive to multinational firms with production and marketing operations in several countries with divergent environmental systems.

We can think about the trend toward industry self-regulation in terms of a hypothesis advanced by Coase (1960).[14] If, according to Coase, government regulation can be a transaction cost economizing alternative to individual market

[14]Coase (1960/1998, 1994) has lamented the effect that his 1960 essay has had on economics. His contention, recently supported by Farber (1997), is that the true message of his 1960 essay has been lost on economists. The exposition of the so-called "Coase Theorem", a phrase that originated with Stigler, not with Coase, was not the aim of the paper. The world without transaction costs that is described in the first five sections of the paper is presented to illustrate a paradox in economic theory. In such a world, uncompensated external costs, monopolies, public good and free rider problems would be negotiated away by those who acted to exploit the latent gains from bilateral or multilateral exchange that deadweight losses represent. The paradox is that the economic theory of 1960, and according to Coase, the economic theory of 1992, had not integrated transaction costs into its conceptual apparatus. It was therefore incapable of providing a coherent explanation of how problems of monopoly, public goods or externalities could persist. Coase, in contrast, had already described the real world as awash in transaction costs in 1937. The description of a world without transaction costs as a "Coasian" world is a fundamental error. Coase's claim is that the world of economic theory is the world without transaction costs.

If there is a real Coase theorem in the 1960 essay, it goes something like this. The world in which we live is one in which transactions are costly. Before we can transact, we need to search for potential partners and then we need to negotiate terms. These activities consume resources. In some circumstances, according to Coase "An alternative solution is direct governmental regulation. Instead of instituting a legal system of rights which can be modified by transactions on the market, the government may impose regulations which state what people must not do and which have to be obeyed." (Coase, 1960/1988, p. 117). This "Coase Theorem", is that, under a given set of institutional and technological conditions, regulation by the state may be a transaction cost economizing alternative to the resolution of problems through market transactions. It becomes an empirical question, therefore, of under what institutional and technological circumstances is this likely to be the case, and how can we tell if those circumstances occur.

The re-emergence of industry self-regulation, motivated by the negative incentives of avoiding potential liability or by the positive incentives of increasing market share, represents a test of this Coasian hypothesis. Have institutional or technological conditions changed recently so that government regulation formerly was a transaction cost economizing means of resolving problems of harmful interdependence, but no longer is? Coase, in sections VI and VIII of his 1960 essay explains that there is no reason to believe that the actual pattern of regulation undertaken by real governments will necessarily be a transaction cost economizing alternative to individual transactions. So another hypothesis is that existing regulations that are being abandoned may be cases of actions that were not really justified, in the Coasian sense, originally.

exchanges under specific institutional or technological conditions, then the observed increase in interest in industry self-regulation could simply be a response to underlying changes in institutions or technology.

A more accurate understanding of Coase's hypothesis also has important implications for the conventional economic analysis of the harmonization of environmental regulations. As Patricia Lindsey and Mary Bohman explained to this workshop last year, differences in environmental comparative advantage, technology, standards of living or preferences would provide a rationale for different regimes of environmental regulations in different countries. But this analysis is incomplete, in that it ignores a potentially important category of transaction costs. The need to adjust product specifications to different national regulatory requirements increases transaction costs. Firms may elect to not sell into as many markets under these circumstances, foregoing potential economies of size, scale or scope. Harmonization of regulations may be an important means of economizing on transaction costs.

Our profession has conducted little analysis of the forces driving this apparent trend and the potential consequences for environmental management in agriculture. Only anecdotal and case study data are available. If the privately-led initiatives offer joint private and public benefits, then strategic public assistance may be used to accelerate and expand the process (Batie and Ervin). We would like to see this group tackle the empirical work necessary to determine if this is true.

Private action generally does not suffice for solving transboundary environmental problems. They require multilateral cooperation, which involves huge transaction costs. The Montreal Protocol to reduce ozone-depleting substances and the Rio Conventions on climate change and biodiversity illustrate such approaches. Although there are more than 1000 separate international environmental agreements (IEAs), their overall effectiveness has not been assessed. The small number, about 20, that use trade measures appear to be effective. Research suggests that cooperative multilateral action with trade sanctions fosters "stronger" environmental standards than unilateral action (Barrett, 1996).

As evolving science reveals new linkages of environmental systems across borders and countries multiply their connections through international commerce, the impetus for structuring new IEAs will grow. This likely development could give two side benefits to lessen trade disputes. First, the IEAs will require some form of agreement on harmonized standards for the issues at hand. Second, appeal to a recognized international environmental agreement seems to be an admissible defense to a NAFTA or GATT challenge.

CONCLUSIONS AND RESEARCH RECOMMENDATIONS

Our digest of the available literature indicates that while there is much that we still do not know about the complex relationship between trade liberalization in agriculture and environmental stewardship, there is at least a preponderance of evidence

accumulating on some aspects of this relationship. For example, there is reason to believe that an environmental dividend is at least possible from the pursuit of trade liberalization in agriculture. We would hasten to add that the realization of that dividend is contingent on an appropriate integration of trade and agricultural policies and environmental policies and institutions. And local variations in ecological, physical and social circumstances play a critical role in shaping the nature and size of that potential dividend. Unfortunately, available models and baseline data are typically too aggregative to facilitate satisfying analysis of the impact of these local variations in conditions. But the costs of undertaking extensively disaggregated environmental analysis of the effects of trade liberalization would be enormous.

In addition, there seems to be at least some shreds of evidence that compliance costs associated with environmental regulations are not likely to play a determinative role in the location of agricultural production, either at the primary or subsequent processing levels, or in the patterns of trade. Of course, further research in this area may contradict the admittedly limited evidence compiled so far, but at least from the perspective of what we know today, the risk of the kind of "race to the bottom" on environmental standards that figured so prominently in the NAFTA debate would seem to be small in the case of agriculture.

If the prognosticators that have suggested environmental issues will figure prominently in the next multilateral round of trade negotiations in the WTO are correct, then our list of potentially controversial agriculturally related resource and environmental issues anticipates a difficult way ahead on the path to further trade liberalization. If the Article XX provisions of the GATT are retained or expanded, then there will be much analytical and empirical work to be done to aid in the more effective targeting of agricultural resource conservation programs and on pricing for water and government land used in agriculture to better reflect the opportunity costs of those resources. This will be much easier to say than to do. But trade policy analysts revel in the challenge of solving problems that have confounded production and natural resource economists.

At a more fundamental level, we would like to suggest that more attention be devoted to clarification of some conceptual issues. For example, calls for better integration of agricultural trade and environmental policies are increasingly common place, both by constituents of trade liberalization and of environmental stewardship. But it is not clear what integration means. And, in our judgement, "policy" has all too often been construed too narrowly. We would argue that integration does *not* mean subservience of one of these agendas to the other. And our professional experience indicates that there are important language, ethical and conceptual issues that divide trade liberalization advocates from their counterparts on the environmental stewardship side.

On the question of the narrowness of the concept of policy, we would like to propose that our collective consciousness be more aware of the role of policy initiatives and institutional changes that arise outside of the realm of interactions among national governments. Subnational governments also have policy functions, as do

private voluntary associations. And legislation is not the only instrument that regulates activities that have environmental consequences. As Elizabeth Brubaker (1995) has shown so effectively, common law remedies against trespass, nuisance and the violation of riparian rights played an important role in the regulation of emissions from production, even from agricultural production, in the United Kingdom, Canada and the United States until the effectiveness of those institutions was undermined by judicial "innovation" or by legislative law. Discussions of the integration of agricultural trade and resource conservation policies need to better reflect the complementarity and the competition among different levels of policy making.

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Section 5

Implications, Research Needs and Future Direction

The objective of the concluding discussion is to summarize "what we have learned", viewed from the perspective of three countries and several work environments.

AMERICAN FARM BUREAU FEDERATION

Terry Francl

The last two papers raised issues which must be addressed. Concerning the whole issue of harmonization, the question is not who is smaller or who is bigger, it is one of philosophy. In the United States, the majority of the members of the American Farm Bureau (AFB) believe that the free market is the best way to pursue agricultural policy. It is best for consumers, government and producers. While everyone in the United States may not believe that, a majority has come around to that viewpoint. This perspective is not going to be reversed in any meaningful way. We are on a road of taking government out of agriculture and that is going to continue.

I disagree with Don McClatchy's statement that U.S. support for agriculture is still high. In the mid-1980s, U.S. government expenditures on agriculture were $26 to $27 billion. They are now at $7 to $8 billion. U.S. farm program payments to farmers will decline to $4 billion in 2002. The European Union is still at a level of $40 to $50 billion. So I do not think it is appropriate to characterize the U.S. level of farm support as still high.

Another issue—whether Canada is explicitly or implicitly moving toward the concept of a U.S. loan rate. The U.S. loan program is not set up as a support price for a commodity. There is, in fact, no support. If the market price goes below the loan rate, there is what is called a POP payment. That is the difference between whatever the loan rate is and the market price. The floor is gone. Our prices could literally go to zero. There is a payment to producers below the loan rate, but it is not a floor.

The comments about the food system were very insightful. Recently, I was at a meeting about grocery stores. The whole system of food preparation has changed. The majority of homemakers do not know how to cook a turkey. We are in a new world. Preparation is going to be more and more important.

With regard to new technologies, my local elevator operator recently indicated he was going to have to get into seed sales—a new enterprise. The reason is that he is losing his chemical sales due to biotechnology (GMO seed) and that is where the profit was. It is going to be difficult for my friend because many of the local farmers are seed salesmen as well. The point is that structural change is occurring throughout the whole system.

The movement to produce crops and livestock in less developed countries is occurring. This trend is less friendly to those environments. While it is possible to improve what we are doing in the United States and Canada, current practices are better for the environment than cutting down more rain forests.

It was mentioned that farmers are no longer perceived as being the stewards of the environment. I take issue with that. American Farm Bureau Federation focus group studies have indicated that farmers are still identified as having a positive impact on the environment. The negativism is coming from environmental organizations like Earth Justice.

The National Pork Producers Council's decision to support federal environmental permitting standards was based on overriding what was happening at the state level. The unfortunate part of this is that by setting up a permit process, the industry has gone from non-point to point pollution regulation. That is something which the environmentalists have been wanting to do to agriculture since the first day of the Clean Water Act. Until now they have never been successful. Consequently, the NPPC agreement with the U.S. Environmental Protection Agency (EPA) is setting an unfortunate precedent. It has raised the regulatory bar to a higher level. The various state legislatures are not going to go back and renegotiate. However, many states are going to say that this is where the bar is now and we are going to start negotiating from here on up.

This decision is also very unfortunate because we have cut pork producers from the rest of agriculture. The EPA is now talking to the poultry industry and saying that they are setting up a permitting process. If you join in the talks, you might have some input. If you do not join in this, we are going to push it through anyway. It is called divide and conquer. They are well on there way.

The Europeans are suggesting that trade in grain involves transportation which is more environmentally harmful because of the cost. In fact, international trade represents the most efficient cost. Environmental benefits are gained from trade as opposed to self-sufficiency orientated policies. This is just another attempt by the Europeans to install additional non-tariff trade barriers.

SASKATCHEWAN WHEAT POOL

Shelley Thompson

Thank you for the invitation to participate in this conference. It has been very informative; the papers very well done; the discussion interesting and the people wonderful. Saskatchewan Wheat Pool (SWP) is very pleased to be a sponsor of the conference—we care deeply about the health of the agricultural sector. It is my understanding that as a wrap up panelist, my job is to synthesize the papers and highlight crosscurrents about competitiveness. I am going to approach my task slightly differently and suggest a different framework to view competitiveness. Innovation can be risky, so please bear with me.

While I listened to the papers, it was clear that competitiveness is complex and multi-dimensional. To capture competitiveness, perhaps we should use a balanced scorecard approach: consumer orientation, financial viability, business process and intangible assets. I believe that all of these components are necessary for longer-term supply chain competitiveness.

I agree with Barb Isman that the customer drives the business. This quadrant measures the success of meeting the customer's need. Does the sector produce what the customer is willing to pay for? Are you retaining customers that are profitable?

The second quadrant is the financial viability of the chain. I was very pleased to see the break-even analysis in the U.S. livestock presentation. Volume and market share are not necessarily related to profit. For financial success, the supply chain has to produce cash flow for all of its participants.

The third quadrant is business process. Here, I would place such things as food safety, quality, logistical and information process. The world is now very process orientated and this will continue in the future.

The fourth quadrant contains intangible assets such as intellectual property rights, research and development, environment and people. This quadrant also reflects our responsibilities and commitments to society. In order to be competitive, there has to be learning and growth in the supply chain.

In the brave new world, risk management, as mentioned many times, will be a fundamental core competency. This approach also reflects the importance of people, and in the final analysis, it is people that actually change the functionality of supply chains. As an example of this paradigm, I would like to give you an example of

starting to build a competitive supply chain utilizing a balanced scorecard involving what Barb Isman would consider the “have nots.” These are producers of organic grain and oilseeds.

There are several hundred Saskatchewan producers with organic production and many more producers with semi-organic production. They have small farms and very low gross farm incomes. Prior to SWP directly entering the supply chain, there were problems with producers not getting paid for products and having to wait a long time for payment. The supply chain was very fragmented and dysfunctional.

The consumer demand for organic production is strong and growing. Saskatchewan Wheat Pool has worked on the four quadrants. The first is consumer demand. We make sure producers know what end users want. The second is process. In this quadrant, we have identity preservation, the certification process, standardizing, organic regulations and Canadian Wheat Board “buy-backs”. The third quadrant is people. We have meetings to help producers become certified. We also educate them on environmental concerns and social responsibility. The final quadrant is the financial side. Producers are paid and connected to an end user. SWP utilizes redundant assets which can be utilized for identity preservation. We can also link the producers and end users with production contracting.

Thank you for the opportunity to participate in the conference. It has been a valuable experience.

SECRETARIAT OF AGRICULTURE, LIVESTOCK AND RURAL DEVELOPMENT, MEXICO

Roberto Aceves Ávila

I would like to begin by adding to what was said about the meaning of "competitiveness". It may not be possible to answer that question right now. We are certainly more aware of the subtle interrelationships between our three economies and how our competitiveness might be affected by the new interrelationships among the three agricultural sectors. Through the papers and related discussion, we have learned, not only of the changes in policy, but also about the increasing role of integration for producers and the concept of "harmonization".

In fact, harmonization was approached in a very practical way yesterday. Comments were made as to what effect the North American Free Trade Agreement (NAFTA) and other policy harmonization measures have had on marketing and infrastructure. If you define clear long-term rules for participants, the private sector and private organizations will search for the best business opportunities available. They will always try to find a way to do business no matter how critical or unharmonized things look. In Mexico, by linking the price of most grains to international market references, companies like Cargill, Prudential and Merrill-Lynch are trying to correct the marketing problems in order to do business. For example, Prudential and Merrill-Lynch are operating commodity-backed operations in sugar and grains. They know that there are serious deficiencies in Mexican warehouses. They know that the Mexican market generally lacks trust in warehouse certificates. Still, they are doing business with these instruments. How are they doing this?

They are pinpointing specific projects and creating their own supervising units for their own programs. They are certificating their own warehouses. They are selecting very specific clients. They are not waiting for the government to reform the whole system. Continental, Dreyfus and Cargill are beginning to build silos and are planning new business strategies for grain consumers in specific regional markets.

Even producers and the government are having to design new strategies to survive and make use of the new instruments that harmonization provides. For example, linking domestic prices to international references gives Mexico the opportunity to use the Chicago Board of Trade and the Kansas City Board of Trade as instruments for managing risk for producers and for the government. Mexico has the *Risk Management for Producers* program which subsidizes the cost of options for producers.

The government also used these instruments to back its own loan support program. This was the case in 1992 when Mexico had to give subsidies to the wheat industry. The industry had to buy wheat from Mexican producers at a specific target price. The government refunded the difference between the target price and the international market price. The Mexican government used the Chicago Board of Trade to hedge the whole Mexican wheat crop. At one time, although nobody wants to believe this, Mexico controlled about 20 percent of the total positions on the futures market in Chicago. The Commodity Futures Trading Corporation had to call us and ask, "Okay, we think you are nice guys, but why are you doing this?" We told them we were just hedging our budget risks using market instruments.

In order to protect the budgetary allocations for the merchandising subsidy to the wheat milling industry, the federal government sold Chicago wheat futures contracts in different delivery months. All contracts were sold at prices that equaled or surpassed the futures price level used to allocate the initial budget subsidy payments. At the start of the harvest, Mexican wheat sales were made into the local market and part of the hedge was canceled. Later, when the wheat subsidy program was changed, the balance of the hedge was lifted, with all positions benefitting the federal government in its budgetary position.

Firms and the governments of the three countries are changing how business is done in Mexico. I believe that producers and the private sector will always be ahead of governments and policy reform. Even though our policies are designed to have official trade dispute settlement mechanisms, we are seeing a rising trend for private trade dispute settlement mechanisms. The private sector is finding more efficient ways to solve those problems. They are not waiting for the government to harmonize or reform laws.

For example, there is the specific case of tomatoes. You remember the tomato controversy with U.S. producers—the anti-dumping case that ended in an administered price agreement. We can also cite beef and livestock anti-dumping cases Mexico has with U.S. producers. They were satisfactorily solved by private trade dispute settlement. Also, we have a dumping case with wheat involving the Canadian Wheat Board and the Export Enhancement Program of the United States.

I believe that the practical ways of approaching harmonization or searching for new solutions should be stressed at future conferences. I would like to congratulate the organizers for the excellent job they did. I also want to congratulate the participants for the high-quality work which has been done to help us learn more about the new business environment for our economies.

AGRICULTURE AND AGRI-FOOD CANADA

Ken Ash

I will make two general points and then discuss specific policy implications from the Canadian point of view.

First General Point. It is increasingly difficult for public policy to continue to pursue the very diverse and often competing goals that have been associated with traditional farm policy. This is a fairly recent phenomenon. Many of the papers in the last couple of days have talked about some recent influences on the grain-livestock sector—globalization, internationalization and so on. These help shape public policy. But there are two influences which have not been talked about with the same detail.

- One is the Canadian fiscal situation. We as a country have had significant deficit and debt problems for some time. The good news is that when you are "broke", it makes you pay more attention to how you spend your money. In the past three or four years, we have done that; major policy changes have resulted, and our current fiscal situation has dramatically improved. But fiscal restraint remains an important influence on public policy choices.
- Second, our economic performance. Canadian economic growth and job creation have not met public expectations. This is a key priority of government, and will considerably influence the policy agenda.

The result, for Canada, is an increase in the relative weighting or importance of economic efficiency-type goals in the agri-food sector. Growth and competitiveness matter much more now than in the past. Socio-economic aspects are still important; there has certainly not been an abandonment of social considerations, but there has been increased focus on economic efficiency and global competitiveness.

Second General Point. The changing nature of global food demand has not been lost on policy makers. Canada's domestic market is relatively small. The big opportunities are abroad. The biggest opportunity is downstream, in the higher value added area. This matters for a variety of reasons. If Canada is going to be competitive in livestock production and processing, then, by necessity, we are going to need to have a much more liberal policy environment than we have had in the past.

Let me be a little more specific. If you accept these two general points what does it mean for some of the policies we have in Canada?

- First, people need to understand the current industry structure in Canada. We have 280,000 farms. They are changing markedly. About two-thirds of the farms in Canada have sales less than $100,000. They receive 13 percent of their family incomes from farming. The other 90,000 farms have sales over $100,000. They make the majority of their income from farming—most over 60 percent. Many of these farms have net income over $70,000. That is a healthy income. Farm policy is often aimed at neither group; it is most often aimed at the "average farm." With such disaggregated analysis, the desirability of more targeted policy options can readily be seen.
- Second, the trend is towards larger, more industrial-type farms. There has been considerable discussion in this workshop about supply chain management and vertical integration. Rather than ownership integration, I believe we are talking about vertical coordination and improved communication up and down the food chain. Some of the implications are positive; others are not so clear. For example, there is a significant opportunity to replace publicly funded safety nets with forward contracts. One of the healthiest components of the farm sector in Canada is the potato industry. Not so long ago, when french fries were in their infancy, there was a big concern about the level of contract prices for potatoes. Now, you can get contracts well in excess of production costs. Government safety nets are not needed to cover price variability if you have good contract prices.
- It is not clear whether the Canadian industry is going to continue to export grain or become a meat or processed product exporting industry. Depending on the way it evolves, it will matter significantly for trade flows and for public policy. Right now, we have 36 million hectares in production and another 6 million in summer fallow. We do not believe that there is much more land available. It may not be possible to increase output much more than it is now. If you begin to feed that grain and slaughter those animals to produce a processed product, you are not going to be exporting that grain. There is a fork in the road ahead: will we continue to be grain exporters, or meat and meat product exporters?
- Fourth, regulatory harmonization; to me, this means compatibility, which does not require the same policies/standards as other countries. But neither need we be any more different than necessary. We can maintain our sovereignty while meeting other country's consumer expectations. We are not going to become internationally harmonized/compatible in a short time. If all we had to do was harmonize new regulations and policies, we might do so more quickly. The real trick is trying to harmonize those things which are

already in place. Every microregulation we have was generated by someone, for some reason, or it would not be there. When you try to change established policies, it is a more difficult problem.

- Finally, productivity initiatives are going to become increasingly important for Canada. Some people would prefer to pull some money out of safety nets, for example, and put it towards initiatives to minimize costs, add more value, differentiate our products, and give us the capability to be more competitive, produce more products and make more money from the marketplace.

There are major risks and uncertainties ahead. Most of the policies in Canada in recent years evolved out of periods when prices were good. We are going to enter a period, maybe in the next year or two, when crop prices are going to be lower. It is not a foregone conclusion that we are going to stay on the same path. The debate about safety nets and ad hoc payments is not over. Not long ago, I thought the debate about export credit was over. But, now it is back on the table.

I will close with one brief comment on the nature of policy in different countries. In Canada, we recently abolished the grain transportation subsidy. A very conscious decision was made to pay out $1.6 billion in one payment to producers. In the United States, under the Federal Agriculture Improvement and Reform (FAIR) Act, transition payments to farmers are being made over a longer period of time. I do not know if that means they intend to continue, to stop or to extend payments beyond 2002. Payments have been decoupled, but cost more money than if the old programs continued. That is progress, in that by decoupling, governments are going in the right direction. It is a good prescription, but questions can be raised about the dosage. With respect to the European Union (EU), it looks like it will not be seven-year payments. To the extent that reforms are made, they might be perpetual payments—somewhat close to decoupled, but not decoupled. These are improvements, but there is still a long way to go to ensure a truly level playing field across countries.

NATIONAL CATTLEMEN'S BEEF ASSOCIATION

Chuck Lambert

This conference is the first time I have participated with this group. I hope that I have brought something to the table, because it has been a very good learning experience for me.

We have many more issues in common than we have in conflict. In the 1999 World Trade Organization (WTO) round, we all want to be sure that the European Union (EU) does not rollback the progress we have made to date with respect to STS agreements and to using a science-based resolution to settle disputes. Sometime in the next two or three years, we will address China's accession to settle the WTO. That will involve discussions about state trading entities, tariff rollbacks, and inspection equivalence. We will also likely revisit a Western Hemisphere alliance. Many of us will be addressing—if not together, then separately—similar issues.

The conference hit many of the issues that the National Cattlemen's Beef Association (NCBA), as an organization, is facing on a daily basis. We lobbied heavily for fast track authority. Currently, we are lobbying for International Monetary Fund (IMF) funding. We are facing challenges to continued Market Access Program (MAP) funding. The whole U.S. budget and appropriations process is currently underway. There are many things which relate to trade in that process. This conference addressed food safety, technology applications, environmental issues, restructuring and contractual alignments.

There has been a lot of soul searching and philosophical debate in the beef industry recently. The United States is experiencing not only a reorganization of the beef industry, but a reorganization of beef industry organizations.

Two years ago, the National Cattlemen's Association has been through a merger and realignment with the National Livestock and Meat Board. It has merged marketing and policy and is now the National Cattlemen's Beef Association. As the industry has changed, those organizations and support mechanisms that work with the beef industry have changed. Change in the underlying industry will drive change in the supporting organizations and institutions. This process will continue in the future.

AN OVERVIEW OF SOME OF THE COMMENTS FROM THE GENERAL DISCUSSION

- I was with a well-known veterinarian from Minnesota a couple of years ago when he almost got drawn and quartered for saying that the only sustainable system for the production of hogs was in 1,200 sow or greater units on two or three sites located in areas having crop production. That is not the *only* sustainable system, but it is sustainable because it is very efficient. We in agriculture have let other people define what "sustainable" is. We need to define what sustainable is or let the market do it.
- About value chain coordination—I am working on a project which is not integration, although there are some contracts. As Tom Peter said in one of his books, we are discovering a powerful management tool, "we talk to each other." It is amazing what you can do when you lock people in a room with no breaks until they decide something. Look at the cost differences of trying to vertically coordinate a company which already exists versus going to somewhere that has a blank slate and building one which is vertically coordinated. I will take the latter any day. That is one reason why the North Carolina pork industry grew so rapidly—it did not have to displace anything.
- My children think that pesticides are bad and fertilizers pollute water. They do not like anyone cutting down trees, and they are close to being vegetarians. They have been influenced by environmentism. Look at the magazine "Ranger Rick" sometime. That little cartoon raccoon is a radical environmentalist. Read some of the not too subtle articles. Agricultural organizations have been slow to pick up on this approach. The American Farm Bureau Federation (AFBF) is now sending people to the National Science Teachers meetings and putting out AFBF information. Folks, we have let this one go way too long. We are raising a generation of environmentalists.
- Terry Francl gave an elegant plea for the notion of the free market. I hope that you really do not mean the free market because I find that term non-operational, non-functional and non-useful. There are no free markets—there are just variations of them. Roberto Aceves Ávila mentioned that on one occasion Mexico made the Chicago Board of Trade (CBT) nervous by having a 30 percent position in the wheat futures market. If the Canadian Wheat Board (CWB) happened to be there the same day and put a few of their trades on we would probably be up to 50 percent. That would be a total of 80 percent control of the CBT by Canada and Mexico. If you do not like a state

trading enterprise changing the structure of the industry, the logical alternative is to let Saskatchewan Pool put private trades or part of its annual movement of wheat on the CBT. Otherwise, very easily, you can have two foreign institutions controlling the CBT. We all know that would be stopped by regulation.

- When you are talking about free markets, I hope you are talking about markets which are disciplined by competition. If that is what you are talking about, you will find a lot of agreement among Canadians. If it is really the free market which is the issue, we are a long way from eliminating trade stress. I hope that this is a semantic issue and not a genuinely philosophical one.
- The fact that the CWB and the Mexican Government were used in the same example as a free market example just shows how far apart we are. In no shape or way does that represent a free market. The definition of a free market is many producers and many buyers and sellers. The important part of the market is the price signals which are sent to both producers and consumers. To the extent that there is a good exchange of those signals and regulations which set the rules, the market signals are superior to the government being in control, even though there are winners and losers.
- The old way for governments to monitor performance was to look at market share and the top four firms. Markets were thought of in the sense of sending signals back and forth between producers and consumers. This conference indicates that was the way it was and what is good for the future. It will be one vertical value chain competing against another. The traditional ways for economists to value performance will not be applicable.
- There will be a lot of competition for the consumer's food dollar. Competitiveness will be measured by market share and profitability in serving the consumer. It is in our best interest to treat the producer very well.
- Some people say that there is less competition—that we are getting more concentration, fewer, shorter supply chains and lower prices. These people assert that everybody is going to gobble each other up. However, technology can change things very quickly. It will change the way business is done. Very significant technological change can dramatically lower transaction costs. Technology is the fundamental difference that will increase competition. The costs of information will be the driving force. I am not worrying about competition. I think we will see much more.
- What happens the first time there is a failure in a concentrated system? A firm that knows it is too big to fail will leave incentives that lead to failure. When failure occurs, the regulatory hammer will come down.

- We have had a big discussion about what is harmonization. I sing lead in a gospel quartet. When I think of harmony, I sing my part and the other three guys sing their parts. When we mess up and try to sing someone else's part, it gets messed up pretty badly. If you will take the word harmonization and break it down to its root, then what Canada does and what the United States does and what Mexico does—certainly does not need to be the same thing. But, everyone likes to sing lead. We have different songs which feature different people.

Trade disputes and trade agreements have an important characteristic in common — they raise the question of whether and how domestic policies between trading nations can be made more compatible, more consistent, and if they can be harmonized. Serious consideration of these issues raises more basic questions — what do these terms mean, in a practical sense, in bilateral and multilateral trade relations?

This publication is the fourth in a series of annual workshop proceedings designed to produce timely, relevant, economic analysis related to agricultural, food and trade policy between Canada, the United States and Mexico.

It contains papers, research results and discussion comments by academic economists, industry representatives and government officials from Canada, the United States and Mexico. The purpose of the workshop and this publication is to take the harmonization theme to the next level of the status of policy and trade harmonization issues in grain and livestock in the three NAFTA countries. The organizers of the workshop believe accurate economic information can influence positively the course of trade relations and economic welfare.

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