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**TECHNOLOGY INSTITUTIONS FOR AGRICULTURAL FREE TRADE
IN THE AMERICAS (TIAFTA)**

**A Study on Agricultural Production Trends and Institutional Dynamics Within the
Evolving Western Hemispheric Free Trade Region**

Phase I

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By

**David D Bathrick - Study Coordinator / Agricultural Development Institution Specialist
Kerry J Byrnes - Technology Institutions Analyst
John G Stovall - Agricultural Economist / Market Analyst
and
Donna R Podems - Research Assistant**

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LIST OF ACRONYMS

Ag REE	Agricultural Research, Extension and Education System
APAC	Agricultural Policy Advisory Committee
APHIS	Animal Plant Health Inspection Service
ARD	Agriculture Rural Development
ARI	Agricultural Research Institute
ATPA	Andean Trade Preference Act
BIFAD	Board for International Agricultural Development
CACM	Central American Common Market
CARICOM	Caribbean Community and Common Market
CBGA	Caribbean Basin Growers Association
CBI	Caribbean Basin Initiative
CIFA	Consortium of Inter-American Agricultural Foundations
CIMMYT	International Center for Wheat and Maize Improvement
CLGU	Global Land Grant University
CRSP	Collaborative Research Support Program
EEP	Export Enhancement Program
ERS	Economic Research Service
FAO	Food and Agriculture Organization
FIA	Agricultural Research Fund
FLAR	Latin American Irrigated Rice Fund [<i>Fondo Latinoamericano para el Arroz Bajo Riego</i>]
FTAA	Free Trade Area of the Americas
GATT	General Agreement on Tariffs and Trade
GREAN	Global Research on the Environmental and Agricultural Nexus
HACCP	Hazard Analysis and Critical Control Points
HVF	High Valued Foods
IICA	Inter-American Institute for Cooperation in Agriculture
IMPACT	Agricultural Commodities and Trade
IDB	Inter-American Development Bank
INIA	National Agricultural Research Institute [<i>Instituto Nacional de Investigación Agropecuaria</i>]
IS	Import Substitution
ISNAR	International Service for National Agricultural Research
LAC	Latin American and the Caribbean
LAIA	Latin American Integration Association
LDC	Less Developed Country
MERCOSUR	Common Market of the Southern Cone
MIF	Multilateral Investment Fund
NAFTA	North American Free Trade Agreement
NARS	National Agricultural Research Systems
NGO	Non-Governmental Organization
NTAE	Nontraditional Agricultural Export
PROCI	Programs of Regional Cooperation [<i>Programas Cooperativas Regionales</i>]
PVO	Private Voluntary Organization
RFAT	Regional Fund for Agricultural Technology
SAES	State Agricultural Experimentation Stations

SAL	Structural Adjustment Loan
SPARLAC	Sustainable Private Agricultural Research in Latin American and the Caribbean
WH	Western Hemisphere
WSU	Washington State University

EXECUTIVE SUMMARY

The movement toward the creation of the Free Trade Area of the Americas (FTAA) marks the sunset of the import substitution era for many Latin American and Caribbean (LAC) countries and the dawn of an unparalleled opportunity for economic development throughout the Western Hemisphere. Building on nearly a decade of democratic reforms in LAC countries and recent trade liberalization initiatives, there is renewed hope that the hemisphere is now in position to achieve broad-based economic growth that is socially equitable and environmentally sustainable. However, for this to occur, a significant segment of small- to medium-sized agricultural enterprises (farmers and agribusinesses) must make the transformation to a more competitive enterprise environment. While some farmers will be able to increase their income through agricultural production, other off-farm agricultural activities must be created to provide new jobs for farmers who may be displaced. Without such adjustments in the broader agricultural system, there will be a weak foundation for sustainable development in the hemisphere.

Agriculture and agriculturally-based industries are emerging as potential lead sectors for socially equitable and environmentally sustainable economic growth in the hemisphere's increasingly competitive market-driven economy. In this economy, where agricultural enterprises will have to constantly adjust to meet changing opportunities and constraints, producer ability to compete depends, among other factors, on timely access to appropriate information and technology as well as on skills in management and marketing. While this trend is illustrated by the growing importance of higher-valued, nontraditional agricultural exports (NTAEs), a large number of cereal producers and NTAE producers are not well-positioned to be competitive. Thus, achieving broad-based economic growth will depend on the hemisphere's capacity to generate economic opportunities for both on- and off-farm employment. Given the current fiscal realities of these governments, new market-led systems for providing appropriate technologies will be an essential and cost-effective activity.

In this broad context, the Technology Institutions for Agricultural Free Trade in the Americas (TIAFTA) study focuses on 1) the agricultural sector's response to trade liberalization opportunities, 2) the existing institutional capacities of national agricultural technology systems to respond to trade-driven agriculture, and 3) the activities of key international, regional, and U.S.-based institutions that potentially could support the development of hemispheric technology generation and transfer capacity to support trade-driven agriculture. Recommendations are given for conceptualizing and designing a new hemisphere-wide agricultural technology system to support trade-driven agriculture.

Trade Liberalization Responses

Beginning in the mid-1980s, new democratic governments in the LAC region gradually began to move away from the import substitution legacy by 1) privatizing many state-owned enterprises (many of which were in the agricultural sector), 2) liberalizing trade policies, 3) reducing the size of the public sector, and 4) introducing economic integration initiatives, including customs unions, free trade agreements, preferential agreements, and sectoral agreements. The most notable of these agreements are the Uruguay Round of GATT negotiations, NAFTA, and the proposed FTAA. These agreements set the stage for a major transformation of the agricultural sector, a change which has occurred so unobtrusively that there is now a concern that current strategies and responses have not adequately taken into account the challenges or opportunities of free trade. When the lines of this major transformation of the hemisphere's agricultural sector are traced, the following pattern appears:

- LAC countries are going through major restructuring in their patterns of agricultural production and trade based on their unique comparative advantages. Economic integration and increasingly

open economies have led to spectacular growth in intra-regional trade

- Those countries which show the largest increases in annual GDP are those in which agricultural sector performance is improving and where sub-sector diversification is beginning to occur. In these cases, agricultural sector growth and overall economic growth are closely linked to expanding agricultural trade
- The export share of raw agricultural commodities continues to decline both within LAC markets and globally, while the relative importance of high-value products, processed and unprocessed, continues to expand
- Small- to medium-sized producers generally do not appear to have been major beneficiaries of the trend towards liberalization. Thus, for the agricultural sector's small- and medium-sized enterprises to become significant players in the hemisphere's market-driven economy, increased attention will need to be given to creating mechanisms to facilitate access of such enterprises to market information and technology

Current Technology Support Structure

Over the past fifteen years, the LAC region experienced a major deterioration in the capacities of agricultural research, extension, and education systems, particularly as these relate to the needs of small- and medium-sized producers. As measured by a variety of global comparative indicators, ranging from international crop productivity trends to the amounts spent on agricultural researchers for field work, the traditional cereals programs of national agricultural research systems (NARS) possessed limited capacities during the import substitution era to provide small- to medium-sized producers with agricultural technology generation and transfer services. As NARS capacities eroded with dramatic budget declines during the 1990s, these systems have proven even less able to effectively guide and support producers attempting to enter into NTAE production. Further, for the many traditional cereal producers, the NARS have been slow to develop technologies to reduce unit costs of production and/or to develop higher-value alternative farm or land-use systems that provide alternative employment opportunities.

While a small number of activities are under way to develop more relevant technology generation and transfer systems, national and donor interest and support have been inadequate relative to the challenges. This results from the limited number of strategic and institutional models relevant to the hemisphere's changing economic environment. Appropriate roles for the public sector have not been defined and appropriate linkages with the private sector have yet to be forged. In terms of the potential trading relationships that could emerge as part of hemispheric partnerships, linkages with U.S.-based agribusiness and agricultural technology systems have been slow to emerge.

In summary, LAC's traditional agricultural technology institutions have not yet established the strategic and operational processes, and supporting institutional linkages, that will be required to foster - and reap the benefits of - demand-driven agricultural technology generation and transfer.

Institutional Considerations for a Trade-Driven Agricultural Technology System

The shape of LAC's current agricultural research, extension, and education system was forged in part through its collaboration with numerous donors, universities, and development organizations.

While this support began to evaporate in the 1980s, no alternative strategy was in place and little assistance was available for developing new modalities, broadening ties with the private sector, or accessing the greater international agricultural technology system. The institutions which have been the traditional providers of assistance or which have special skills relevant to developing a new approach include the Inter-American Institute for Cooperation in Agriculture (IICA), International Agricultural Research Centers (IARCs), World Bank, Inter-American Development Bank, USAID, USDA, U.S. Land Grant universities, agribusinesses, and PVOs. Generally, these organizations have not 1) anticipated the emerging opportunities, 2) developed appropriate strategies to guide the national systems, or 3) promoted broader collaboration with the private sector. On a parallel front, the articulation of relevant strategies supportive of these changes was a low priority among LAC countries.

Following discussions with representatives from all of these organizations, four very general areas of consensus emerged:

- There is a brewing crisis in Latin American agriculture and unless special priority initiatives and appropriate strategic approaches are soon established, particularly as these relate to the technology needs of small- to medium-sized agricultural enterprises, major problems could develop that impede the momentum of FTAA construction and implementation.
- Donor initiative and cooperation are critical. Considering both the magnitude of the challenges ahead and the necessity of maximizing the impact of scarce resources, the importance of coordination cannot be overestimated. It should be noted, however, that concern about the need for a strategic vision regarding LAC agriculture and appropriate institutional follow-up is concentrated at the working levels of the donor institutions consulted, it was not universally felt at the more senior levels. This dichotomy was particularly evident when strengthening the capacities of agricultural technology generation and transfer systems was discussed.
- While the U.S. is in a position to provide leadership on agricultural and market development issues, most of the organizations consulted lamented the absence, at this critical time, of a strong USAID-led agricultural program to advise LAC countries, donors, and U.S.-based agricultural technology institutions. U.S. expertise is widely regarded as particularly important for the LAC countries to respond to hemispheric trade opportunities, and the provision of support by the U.S. is seen as essential for increasing the chances of rapid market expansion and ensuring mutual benefit and system sustainability.
- Trade-driven agricultural technology generation and transfer strategies need to be developed to guide new donor activities, in this regard, initiatives broader than the traditional public sector approaches are needed to ensure meaningful responses. In particular, attention to private sector linkages needs to be encouraged.

Toward a FTAA Agricultural Technology System

Complementing the TIAFTA study's institutional review, an innovative research and technology exchange program between Washington State and Chile was examined as a possible source of clues to identify how to improve agricultural technology generation and transfer in the hemisphere. This program, involving agricultural producers, researchers, and agribusinesses, is forward looking, particularly from the perspective that comparative advantages and mutual interests of trading partners (and

even competitors) can be built on technology and market development ties. Such experiences alone, however, do not generate a sufficient model to respond to this transition period. While the Washington/Chile example points to the largely untapped potential of mutually beneficial international cooperation in agricultural science and technology, this model's limitations suggest that a larger support network will be needed to support hemispheric agricultural trade.

Given the broad benefits anticipated from the successful construction and implementation of the FTAA, the limited time to experiment with new technology systems prior to the rapidly approaching target date of 2005 for constructing the FTAA, the dispersed nature and major resource constraints in the present agricultural technology "system," and recognition of the urgent need for the development assistance community to exert leadership, the TIAFTA Study Team recommends that a series of coordinated activities to develop and support a trade-driven Agricultural Technology System geared to addressing the emerging technology needs of small- to medium-sized agricultural producers under the FTAA.

If the development assistance community determines that a broader, donor-supported initiative will be necessary to develop an FTAA Agricultural Technology System that effectively links U.S. and LAC institutions, the following recommendations should guide its formulation:

- Bold new institutional paradigms are needed based on the primacy of "institutional comparative advantage." This precept would provide the basis for the establishment of dynamic institutional linkages, operational processes, and working relationships with a broad spectrum of technology-related institutions. The driving concepts in this new paradigm should be "international market-driven," "mutual benefit," "operational agility," "responsiveness to local resource constraints," "responsiveness to market demands," and "sustainability."
- Differences in national comparative advantages will lead to customized institutional models for each country in the region, probably including broader regional and possibly international support services. There is, however, important information regarding the new approaches and lessons learned which should be shared across borders. To address this task, a variety of support bases will need to be coordinated and relevant information shared.
- New "mind sets" must be created at all institutional levels. To aggressively break from the past, all stakeholders must work to develop new processes and experiences to alter the "bad" habits accumulated during the import substitution era. For example, ministers of economy must not view the agricultural sector as a budgetary drain, at the same time, LAC producers must be exposed to relevant positive experiences which demonstrate that they too, under certain conditions, can be competitive.
- Given a consensus to move quickly on developing new strategies and approaches, what is now required is a broader construct that "harnesses" the essential institutions. Respondents indicated a strong sense of urgency to rally around a "task force-like cause of high purpose."
- The concept of "strategic alliances" needs to be thoroughly explored. Programs which encourage mutual benefits and/or foster formal or informal linkages between technology beneficiaries may be the most promising, if they can be forged within the short time remaining prior to 2005.

Follow On Activities

Support for this new initiative needs to be generated at all levels, including

- 1) LAC country-level leaders (many of whom do not yet perceive agriculture as the "engine for national development"),
- 2) Development professionals within the key donor institutions (many of whom may not currently recognize the dynamic role agriculture can play in an open economy), and
- 3) Members of the U S agricultural community (many of whom are skeptical of cooperative arrangements)

To this end, the following targeted activities are recommended

First, The TIAFTA initiative cannot be advanced without broad constituency support throughout the hemisphere from the public sector, the private sector, and the donor community For this to occur, interest levels and possible roles and contributions need to be better defined than was possible during the study's first phase To achieve this objective, the TIAFTA study conclusions and recommendations need to be disseminated to potential stakeholders throughout the hemisphere, and opportunity needs to be provided for their concerns and interests to be considered in the process of designing the proposed FTAA Agricultural Technology System (ATS) Key follow-up should include information sharing and issues identification workshops that facilitate the building of constituency support for the ATS, with particular attention to U S and donor institutions

Second, a series of studies are needed to provide detailed information on the process of agricultural sector transformation in the hemisphere, with the objective of generating information to guide the process of assessing feasibility and conceptualizing a comprehensive strategy for the FTAA Agricultural Technology System (ATS) To meet this need, the following analyses are required

- Country-level, sub-sector, and/or commodity projections and also recent and anticipated inter-regional, country-level, and commodity trade activities
- Responses of small- to medium-sized agricultural producers within selected countries, such as Chile, Costa Rica, Mexico, and Peru, which may be reactions to the emerging hemispheric free trade movement (special focus would be given to NTAE and cereal producers)
- Major technological and information gaps that will need to be overcome in order for small- to medium-sized agricultural enterprises (producers and agribusinesses) to be competitive
- Employment generation potential observed in countries going through similar agricultural sector transformations -- e.g. Chile, Costa Rica, Mexico, and Peru
- Country-level institutional changes and current dynamics in support of market-driven technological change
- Capacities and appropriateness of the institutions described in this document to guide new agricultural technology generation and transfer strategies

INTRODUCTION

The Summit of the Americas created a special opportunity for unique regional cooperation through the creation of the Free Trade Area of the Americas (FTAA). Brazilian President Fernando Henrique Cardoso eloquently stated that a "momentous historic renaissance" had been created with this initiative.

The United States Agency for International Development (USAID) Latin America and Caribbean (LAC) Bureau has participated in various activities and programs to help advance the cause of regional free trade. As one element of a more comprehensive program, the Broad Based Economic Growth Team within the Office of Regional Sustainable Development, requested that LAC TECH conduct the first phase of a broader study entitled, "Technology Institutions for Agricultural Free Trade In the Americas (TIAFTA) "

As agreed at the Summit in Miami, a hemispheric-wide trade zone is to be created by the year 2005. This new regional trading bloc builds from a series of trade liberalization activities and aims to turn back the import substitution policies which dominated the region over the past two decades. As a result, agricultural and agribusiness operations throughout the Hemisphere will have to respond to distant markets and open competition. Such dramatic adjustments will have direct impact on farm-level business decisions. Producers will have to respond to rapidly changing options related to new cropping systems, land use management systems, and environmental practices in an atmosphere of uncertainty and risk. In order to facilitate LAC producer access to the most appropriate information, technologies, and management systems within this rapidly changing market environment, a variety of market-oriented agricultural systems and institutional support structures must be created.

The world's food system is undergoing major adjustments. Changes over the last half century have been particularly pronounced in the Northern Hemisphere, but similar developments are now occurring across the globe. Tom Urban, President and CEO of Pioneer Hi-Bred, expresses one view of how the more client-driven production approaches might, in the future, evolve. He states that

We are on the threshold of a significant shift to industrialization of the world's food system and concurrent shifts in food policy, farm policy, trade policy, and rural development. Industrialization is ultimately a process by which consumers' wants and needs are fed back into a production and distribution system to improve desired quality, availability, and price. It requires a management system that allows the integration of each step in the economic process to achieve increasing efficiencies in terms of capital, labor, and technology (IAMA, 1994: 8).

This vision has particular relevance for USAID's mandate and the future of the FTAA. Appropriate "management systems" will include access to technologies which do not presently exist for most of USAID's traditional beneficiaries/clients. The impact of the "cold winds" of free trade may become particularly harsh within the agricultural sectors of Latin America, where inwardly focused policy has protected producers from international competition. It is likely that rural communities and individuals will face difficulties adapting. In order to ensure maximum opportunities for increasing the economic well being of this group and to avoid the political and social instabilities which neglect may bring, alternative approaches, strategies and systems which can help provide relevant technologies and information must be quickly developed.

This report assesses 1) the agriculture sector's past and present responses to changing economic and trade liberalization activities, 2) the existing institutional capacity of the national agricultural research, extension, and education systems to respond to these changing market-driven trends, and 3) the resources and activities of various international, regional, and U S - based institutions in a position to provide support to hemispheric-wide trade-led development. The report will address each topic and discuss one ongoing approach (the Washington State/Chile Partnership) from among the limited experiences to date. It will also provide overall conclusions and broad recommendations for initiating a more appropriate strategic institutional response to the dramatically changing situation.

More than 220 people from institutions in the United States and the LAC region were contacted by the team as part of this study (Annex D). Informational trips were taken to Cali, Colombia, San Pedro Sula, Honduras, and Buenos Aires, Argentina. The TIAFTA team also visited academicians and agribusiness personnel in Arizona, California, Idaho, Oregon, and Washington. For a listing of people contacted while conducting this study, refer to Annex D. The team also reviewed major agricultural and trade data banks and models along with a considerable number of studies and publications.

SECTION I

HEMISPHERIC TRADE DEVELOPMENTS: CHANGES FROM 1960 TO THE PRESENT BOTH SOUTH AND NORTH

This section provides an overview of the agricultural sector's relatively recent, but dramatic shifts in response to the liberalization of the political and economic policy environment throughout the Latin America and Caribbean (LAC) Region. The following section is divided into six thematic areas: 1) the legacy of the import substitution era and relevant background information, 2) an overview of global and regional trade developments, 3) the sub-regional trade initiatives recently introduced, 4) the status of the Free Trade Area of the Americas, 5) the United States' responses to these developments, and 6) changing production and trade trends. While conducting this review, various data bases and modeling systems were analyzed including the FAO Agrostat, the UN Trade Data Base, the USDA/ERS Western Hemisphere Data Base, and the modeling results of the International Food Policy Research Institute, World Bank, and the University of Minnesota.

A LEGACIES OF THE IMPORT SUBSTITUTION ERA AND IMPORTANT BACKGROUND INFORMATION

In December 1994, the heads of 34 countries met at the Summit of the Americas and agreed to begin a process which will ultimately lead to the creation of a Free Trade Area of the Americas (FTAA) by 2005. This summit was a defining moment in a long struggle to improve the economic well-being of people in the Hemisphere through economic integration and more open economies. Although there are enormous barriers to achieving the objectives of the FTAA, the occasion serves as a reminder of just how far countries of the Hemisphere have come since the decade of the 1960s when few countries had democratically-elected governments and most economies were stagnating under now discredited import substitution policies and tight control by authoritarian governments.

1 Import Substitution

The development strategy known as Import Substitution (IS) was promoted by the UN Economic Commission for Latin America (ECLA) after World War II. IS was based on the premise that incipient industries in developing countries could not overcome the enormous advantage that competing industries in the more developed countries enjoyed unless a wall of protective tariffs was erected around their "infant industries." Under this protection industries in the developing countries could gain experience and expand sufficiently to enjoy economies of scale so as to compete on equal footing with more industrialized economies.

The reality in most countries turned out to be quite different. Protected industries did not generally become competitive, but rather were inefficient, had high production costs, and required even more protection to survive. Even worse were the spillover effects to other non-protected sectors of the economy. IS policies resulted in overvalued currencies, raising the relative cost of nontradeable inputs and reducing the purchasing power of income received from the sales of export commodities.

The agricultural sector - usually taxed rather than protected - suffered under the added burden of the indirect effects of industrial protection which amounted to an indirect tax. According to a series of World Bank studies, this indirect tax on agriculture amounted to an average of 22 percent, in addition to the 8 percent direct tax for the 18 countries studied. One of the conclusions from these studies was that "if a country wants to achieve faster agricultural growth, faster economic growth and fewer poor people, it should stop taxing agriculture relative to other sectors" (Schiff and Valdes, 1992) ¹

2 Agriculture The Engine of Growth

The agricultural sector can be a powerful engine of growth in Latin America if interventions in prices and taxes - both direct and indirect - are reduced or eliminated and the government makes the necessary public investments in agricultural research and education while also investing in infrastructure and public education. More efficient production, brought about by research and education, can be a profound stimulant to the economy because of the high proportion of the labor force employed in agriculture and the increased employment generated in a dynamic agricultural economy. The benefits of agricultural development can quickly spread throughout the economy, lowering the real cost of food and increasing the real income level of poor people.

LAC countries have increasingly abandoned most IS policies, opened their economies, and lowered trade barriers. The turning point started when almost all the nations of the Region elected democratic governments in the 1980s and early 1990s. These new governments soon began charting a different economic course by privatizing many state-owned enterprises, reducing the size of the public sector, and liberalizing trade policies.

Accompanying these new policies, domestic capital returned from abroad while foreign capital began to pour in. According to World Bank figures, the seven largest LAC countries saw foreign capital investment in stock markets, bonds and other forms of investment soar to over \$42 billion in 1993, more than doubling in just one year. Although these countries have since learned that foreign capital can leave as quickly as it appeared, the lesson for the Hemisphere is that the economies of all countries are now linked inextricably together. When the Mexican peso collapsed, other countries suffered economic consequences, both large and small economies. Even Wall Street was affected. In this context, trade liberalization policies are simply adjusting to economic reality.

As more outward-focused and competitive economic forces began to reshape the agriculture sectors of LAC countries, stresses became evident. Agriculture, which in all countries is directly or indirectly the largest source of employment, sustains the largest proportion of the poor, and in

¹ The World Bank Study focused on the production subsector of agriculture and it is not clear to what extent the processing and marketing components of the agricultural sector were protected or discriminated against in LAC. This remains an issue for further investigation and study. If the "beyond the farm gate" part of the agricultural sector was protected rather than taxed under IS policies, such firms may face difficult adjustments under free trade.

most cases is the sector least prepared for such changes. The limited alternative sources of employment for those producers who are displaced as trade liberalization intensifies is becoming a matter of increased concern.

3 The Chilean Example

Chile, often cited as an example of the benefits of trade policy reform, adopted market-oriented economic policies nearly two decades ago. In the mid-1970s, a number of sectoral and trade policy reforms were adopted to foster a market economy, reduce the role of the central government, and stimulate private sector investment and export growth. During the past decade, Chile has experienced remarkable economic growth, while controlling inflation and attracting investment.

Chile's GDP has risen at an average annual rate of more than 6 percent since the late 1980s and the country has experienced increased domestic and foreign investment rates, falling unemployment rates, and lower inflation rates. The agricultural sector has led the way with expanded output under market-oriented free trade: agricultural output rose 70 percent between 1975 and 1993. Agricultural, forest and fishery product exports are approaching a 40 percent share of the country's exports, although these sectors account for only 10 percent of GDP (USDA, 1995b).

B THE GLOBAL AND REGIONAL TRADE BOOM OF THE 1970s AND 1980s

1 The Global Trade Boom

Global trade, an important source of economic growth throughout the world, has been expanding at a phenomenal rate over the past two decades. During the decade of the 1970s world trade increased at the astonishing annual rate of nearly 16 percent but slowed down to a robust 8 percent in the 1980s and early 1990s. Overall, global trade has averaged a 12 percent growth rate over the past 20 years.²

Agricultural trade has also experienced robust growth yet, until recently, trade growth has not been as dramatic in nonagricultural products. Global agricultural trade increased at an annual rate of nearly 12 percent in the 1970s, slowed sharply to under 5 percent in the 1980s and early 1990s, but has since expanded once again into the double digits. World agricultural exports, as a portion of total exports, have declined from the boom years of the 1970s, when they represented 17 percent of total world exports, and now account for only about 9 percent of the world total. Their total export value, however, continues to increase.

² ERS/USDA Western Hemisphere Data Base, reported in Valdes, 1995

2 Western Hemispheric Trade

Export growth in the Western Hemisphere (WH) has paralleled global export growth, but at a slightly slower pace. Dominated by the United States (55 percent of the Hemisphere total in 1992), the Hemisphere's share of world exports declined from about one-fourth in the 1970's to nearly one-fifth in the 1980's mainly because of the IS policies which so negatively affected the agricultural sector.

The Hemisphere has traditionally been a net importer in terms of total trade, but a net exporter of agricultural products. Non-agricultural exports from countries in the WH have grown faster than agricultural products. Twenty years ago agriculture accounted for 24 percent of WH exports but has fallen by half to 12 percent. While the Hemisphere's agricultural exports have increased at a respectable average annual rate of 7 percent over the last 20 years, the rest of the world experienced a slightly higher rate of increase.

The composition of global agricultural trade has changed significantly with important implications for the future.³ There has been an impressive growth in consumer processed items (8 percent per year over the past decade) and a decline in bulk unprocessed goods (down 3 percent during the last decade). In the WH, where bulk commodities have traditionally made up a large share of exports, the same trends are mirrored. Bulk commodity volume fell dramatically (about one-third) in the same 10 year period while consumer processed goods were increasing at a 6 percent rate. Nevertheless, bulk, unprocessed agricultural commodities remain the mainstay of WH exports (66 percent of total exports), while consumer-ready products make up a large portion of imports (67 percent of total imports).

There is a high degree of specialization in commodities and among countries in WH agricultural trade. Ten commodities accounted for almost 53 percent of the region's exports to the rest of the world and 40 percent of the imports came from 10 commodities.⁴ Bulk commodities were high on both lists (imports and exports). Six of the top ten export commodities were bulk and three of the top ten imports were also bulk (C. Valdes, 1995).

Intra-regional agricultural trade amongst countries of the WH has been increasing faster than the interregional trade between the WH and the rest of the world. During this decade intraregional agricultural trade increased more than 5 percent annually, rising from \$18 billion to \$31 billion, and now amounts to 10 percent of world trade. Agricultural imports have also been growing in importance among WH countries, increasing from 54 percent to 61 percent of imports over the past decade.

³ Agricultural trade is classified into four categories: 1) bulk unprocessed, 2) bulk processed, 3) consumer ready, unprocessed, and 4) consumer ready, processed.

⁴ The top ten exports in order of total value are: 1) wheat, 2) soybeans, 3) corn, 4) coffee, 5) tobacco, 6) cotton, 7) beef, 8) bananas, 9) poultry, and 10) sugar.

3 High Valued Agricultural Exports

Much of the attention on export trends has focused on so-called "high valued" or "nontraditional agricultural exports" because of the spectacular growth in markets for some "upscale" products such as fresh fruits, vegetables and flowers in North America and some more affluent LAC areas. The export market for these products has proved a boon for investors and some producers in several LAC countries and for the entrepreneurs who have stitched together a vertically integrated production, marketing, and transportation system that delivers these highly perishable products to North American supermarkets throughout the year.

Consumption patterns are also changing because of rising incomes, more health-conscious lifestyles, and urbanization, these factors have created a strong demand for fresh fruits and vegetables and other high valued food products throughout the year. United States' imports of "nontraditional agricultural exports" (NTAEs) are predicted to grow by at least 3.8 percent per year through the end of the century (USDA, 1995).

"High valued foods" (HVF) or NTAEs are not well defined terms although they are commonly used in the literature. "High valued" usually means the product has had "value added" by processing. "Nontraditional" is even less well defined but generally refers to crops not historically grown for export.⁵ Some donor-supported NTAE operations have been observed to benefit already well-capitalized individuals, and have even been thought to foster similar social conditions that were found on more traditional LAC plantations (see Thrupp, 1995, Islam, 1990, and von Bran, Hotchkiss and Immink, 1990 for analysis of developments in NTAEs). For example, the most recent study of NTAE experiences documents a series of income, job displacement, nutritional, social and environmental problems attributed to the introduction of these programs (Thrupp, 1995). On the other hand, the production process involved in many of these crops is much better suited for labor intensive, small to medium operations. Targeted services, however, may be required for NTAE production to fully realize its social promise.

Despite these social concerns, NTAEs are the fastest growing exports from LAC countries and the growth rates for some products have been remarkable. Cut flowers are the leading NTAE crop in Colombia, while the value of cut flower exports increased 30 fold between 1985 and 1991 in Ecuador. Snow peas in Guatemala shot up from 3.5 million pounds to 25 million pounds in eight years. Melons from Central America have also shown remarkable growth rates and several other examples of rapid growth exist (See Thrupp, 1995).

While NTAE success stories are impressive, it is important to keep them in perspective. Despite rapid growth over the past decade -- really the product of the first generation of post-IS era investments -- NTAEs are only a small but growing part of the Latin American agricultural trade which is still dominated by traditional exports. For example, the value of banana exports from the CACM countries are nearly 12 times as large as all other fruits and vegetables.

⁵ In LAC, the principal traditional export crops are coffee, sugar, and bananas.

4 U S Finding Markets in The Western Hemisphere

Agricultural exports are an important contributor to United States export receipts, earning more than \$40 billion in recent years. While the demand for agricultural imports in the traditional U S markets of Europe and Japan have leveled off, an important source of increases in export demand is in the Hemisphere, particularly our immediate neighbors. U S agricultural exports to WH countries accounted for 27 percent of total WH exports in 1993, up from 19 percent ten years earlier. Canada and Mexico combined to make up three quarters of the WH exports, which means the rest of the WH imported less than eight percent of all U S agricultural exports (see Exhibit 1 - Annex A)

Agricultural trade between the United States and LAC countries has been steadily increasing over the past decade with U S exports rising faster than imports, narrowing the historical agricultural trade deficit (see Exhibit 2 - Annex A). Exports to LAC are mainly grains, animal products and oilseeds, while imports are dominated by coffee, bananas and an increasingly large category of NTAEs (see Exhibits 3 and 4 - Annex A)

C SUB-REGIONAL TRADE AGREEMENTS AND NEW INITIATIVES

The recent transition to democratic governments in the LAC Region and the accompanying economic policy reforms have brought forth a surge of new agreements promoting economic integration and trade liberalization. Most notable are the Uruguay Round of GATT negotiations and the North American Free Trade Agreement (NAFTA). There are, however, a number of lesser-known but important bilateral agreements which have shown notable impacts over the past five years. Now, the "mother of all agreements" has emerged from the Summit of the Americas in December, 1994. The Free Trade Area of the Americas

The more important trade agreements in the WH fall into four types: Customs Unions, Free Trade Agreements, Preferential Agreements, and Sectoral Agreements.⁶

1 Customs unions eliminate all tariffs and non-tariff barriers among member countries and establish a common external tariff on goods from third countries

MERCOSUR (The Common Market of the Southern Cone) was created in 1991 in a treaty signed by Argentina, Brazil, Paraguay and Uruguay. The treaty laid out a four-year trade liberalization program and a commitment to implement a common external tariff. As the largest trading agreement in LAC, MERCOSUR covers over two-thirds of the regional area, involves 44 percent of the region's population, and accounts for more than one-half of LAC's GDP.

This customs union began operating in January 1992, binding tariff preferences between the four member countries and introducing a common external policy on trade with non-member

⁶ See the Interim Report of the OAS Special Committee on Trade to the Western Hemisphere Trade Ministerial for a more complete discussion of this typology.

countries and economic groups MERCOSUR now provides (1) free movement of a high percentage of tradable goods originating in the four country area, (2) a common external tariff, and (3) a common tariff code (IDB, 1995c) Trade among member countries has increased to more than \$9 billion, including a 25 percent increase in 1993 (C Valdes, 1995)

Agricultural products move freely among the four countries with few restrictions and MERCOSUR has few provisions that apply specifically to agriculture The relatively liberal treatment of agriculture is partly because the four countries want to strengthen their agricultural sectors and promote regional exports Many of the state monopolies which controlled trade have been eliminated Because member countries are significant exporters to the rest of the world, their policies have a significant impact on world markets (Josling, 1995)

Andean Group This group, now consisting of Bolivia, Colombia, Ecuador, Peru and Venezuela was formed in 1969 but political and economic problems of member countries held up significant progress until it was revived in the early 1990s The objectives of the group are to eliminate trade barriers within the group, create a customs union with a common external tariff, harmonize economic, social, and economic policies, and adopt a joint industrialization program A common external tariff schedule was not agreed to until 1994, and as a result, it is too early to see if these objectives can be realized

Despite a long history of problems, a measure of success has been achieved The average external import tariff of member countries was reduced two-thirds by 1993 and trade was up 18 percent in one year Internal trade has risen from \$1 billion in 1989 to nearly \$3 billion by 1993 (Josling, 1995)

Free trade was supposed to include agricultural products, but in practice there are numerous exemptions and trade does not flow freely Restrictive macroeconomic policies, including export taxes, overvalued exchange rates, and rigid price controls on agricultural products were common in most member countries Governments were reluctant to allow regional trade to undermine these policies

The countries of the Andean Pact are not major interregional trading partners The Andean mountain chain makes land transportation difficult and costly traditional trade flows have been to the United States and Europe

Central American Common Market (CACM) Begun in 1961, this customs union is comprised of Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua The CACM provided for immediate free trade on 95 percent of all goods and was the most advanced and successful regional integration scheme in LAC during the 1960s (OAS, 1995) The CACM, however, became the victim of political and economic difficulties of member countries during the 1970s and 1980s and survived in name only

The agreement was reinvigorated in the early 1990s following a series of presidential summits Member countries have agreed on a strategy for regional economic integration compatible with external openness and have set common external tariffs Progress in lowering

external tariffs has been difficult because of the dependence on customs revenues by some member countries which face fiscal imbalances

The CACM Countries are small and have relatively open economies with strong trade ties to the United States (more than 40 percent of all trade) CACM countries are net exporters of agricultural products In contrast with other trade blocs, intra-bloc trade, which reached 27 percent of total imports in 1970, has shown a marked decline in recent years to less than one-half that level

The five CACM countries showed their commitment to integration by establishing a new organization, the *Sistema de Integración Centroamericana* (SICA) in 1993 But early in 1995, Costa Rica and Guatemala both increased their tariffs to try to solve fiscal problems (OAS, 1995)

The Caribbean Community and Common Market (CARICOM) consists of Caribbean countries formerly under British rule This regional plan aims to reduce the common external tariff from a high 45 percent to 20 percent by 1998

The FTAA is especially important to the 13 CARICOM countries and could strengthen trade relations and investment links with the rest of the WH There are also challenges, especially whether these economies can sustain the reforms required to realize the benefits of the FTAA

2 Free trade agreements eliminate essentially all tariffs and non-tariff barriers among member countries

The North American Free Trade Agreement (NAFTA), signed by Canada, Mexico, and the United States in late 1992, took effect January 1, 1994 NAFTA was precedent setting in that it established a free trade area among developed and developing countries for the first time in the Americas It seeks to promote free trade in goods and services and increase investment not only by eliminating tariff protection and reducing non-tariff barriers, but also by introducing "GATT plus" trade and investment related disciplines

Building on the Canada-U S Free Trade Agreement, NAFTA substantially expanded coverage of government procurement (to services and construction), intellectual property and investor's rights, as well as more stringent rules of origin Major components include

- **Tariffs and Quotas** All U S Canadian, and Mexican tariffs and quotas will be phased out over 15 years
- **Rules of Origin** Goods made with materials or labor from outside North America qualify for NAFTA treatment only if they undergo "substantial transformation" within a member country

- **Agriculture** About one-half of the existing tariffs and quotas will be eliminated immediately, but those for certain "politically sensitive" commodities such as U S corn sold to Mexico or Mexican peanuts, sugar, and orange juice sold to the United States, will be phased out over a maximum of 15 years
- **Textiles and Apparels** Under strict rules, tariffs will be eliminated only for goods made in North America using spun yarn or fabric from North American fibers

Agriculture is featured prominently in NAFTA, and a separate chapter addresses only specific agricultural issues. In fact, it is remarkable that agreement was reached to liberalize trade in agricultural products given the political strength of protectionist interests in U S agriculture.

Agriculture could have been ignored in NAFTA and might have been were it not for Mexico's strong interest in seeking easier access for farm products in U S and Canadian markets. The prospect of increased competition from these imports and the pessimistic outlook for longer term exports to Mexico, led to demands for continued special treatment for agricultural trade. These pressures were ultimately resisted because the cost of not including agriculture would have been too high. It was generally recognized that sheltered sectors tend to become uncompetitive and consumers would have been penalized by higher food and fiber costs which, in turn, would have affected the entire economy. The compromise was to include agriculture in the free trade area, but provide for a transitional period of up to 15 years (Josling, 1995).

In terms of market access, all agricultural tariffs, with few exceptions, are subject to elimination on the agreed schedule. A few sensitive products have relatively slow reduction schedules. A summary of the more important details of the agreement include:

- Canada and the United States were required to remove tariffs on most livestock commodities immediately
- Mexico, which already had duty-free entry for beef, will phase out all other meat tariffs over a decade
- Cereal trade barriers into Canada are to be eliminated over five years
- With the exception of dairy, eggs, poultry, and sugar (which are excluded from tariff reductions), tariffs will cease to be a major barrier to sales of agricultural products in Canada after 1998
- The United States has a 10-year reduction period for several fruit and vegetable tariffs and 15-year period for a few of the more sensitive products

- Mexico was required to immediately remove tariffs on several vegetables, flowers and nuts, but has a 5-year reduction period for some tree-fruits and a 10-year period for other fruits, cereals and potatoes
- Mexico also has 15 years to reduce tariffs on corn and dried beans

After a full year of NAFTA, two events stand out -- the Mexican economic crisis and negotiations for Chile's accession. The collapse of the Mexican peso and the shock waves felt all over the Hemisphere was a severe test for NAFTA and trade reform in general. There are favorable signs that the agreement has weathered the worst of those storms. The process of bringing Chile into NAFTA has begun, but serious political obstacles are ahead as the Congress and the Clinton Administration spar over fast-track authority amid presidential year politics. Supporters of free trade are cautiously optimistic.

The three NAFTA countries together dominate the Hemisphere in almost all economic measures -- GNP, trade, and population. Agricultural trade is no exception (84 percent of the total). Interegional trade among NAFTA countries accounted for 77 percent of the export growth in the region since the beginning of the 1980s.

Group of Three (G-3) Colombia, Mexico, and Venezuela formed this economic treaty in 1993 and began implementation in early 1995. It calls for the total elimination of tariffs over a 10-year period. Unlike most trade arrangements among LAC countries, the Group of Three goes beyond tariff provisions and deals with such matters as intellectual property rights, services, government procurement, and investment. Each member of the G-3 is also a member of another trading group and negotiations are under way for separate agreements with CARICOM and CACM (C. Valdes *et al*, 1995 and IDB, 1995c).

Bilateral agreements with Chile Chile has negotiated a series of free trade agreements with Mexico, Venezuela, Colombia and Ecuador. These agreements share a common structure although some provisions are tailored to fit specific circumstances. Each contains well developed mechanisms for the settlement of disputes and the administration of the agreements and timetables for the elimination of both tariffs and non-tariff barriers. The agreements do not cover other issues such as trade in services, investment or protection of intellectual property rights.

Other free-trade agreements in the Western Hemisphere include

- Mexico-Costa Rica
- Mexico-Bolivia
- Chile-MERCOSUR (negotiations in progress, 1995)
- Andean Group-MERCOSUR (negotiations in progress, 1995)
- Chile-Peru (negotiations in progress, 1995)

3 Preferential Agreements grant special access to a larger market without making demands for reciprocity

Some of the more important preferential agreements in the WH are

Caribbean Basin Initiative (CBI) The CBI provides duty-free access to U S markets for more than 20 small countries in the Caribbean area. Countries agree, as criteria for eligibility, to maintain certain standards in areas such as intellectual property protection, openness to foreign investment and worker's rights. Since the negotiation of NAFTA, the CBI countries have urged the U S to extend "parity" status to them, i e , extending the NAFTA provisions to CBI countries.

Andean Trade Preference Act (ATPA) Very similar to the CBI, this preferential agreement provides duty free treatment for certain imports into the United States from Bolivia, Colombia, Ecuador, and Peru. They are essentially the same products that are eligible in the CBI.

4 Sectoral Agreements provide for reduced tariff or duty-free treatment among their members on a limited range of products

Latin American Integration Association (LAIA) Formerly known as the "Latin American Free Trade Association" (LAFTA), this sectoral agreement was established in 1980 to promote freer regional trade with preferential tariffs. Members include Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela. The LAIA regulatory and institutional framework has facilitated subregional and bilateral agreements, such as the Andean Pact, MERCOSUR, G-3, and Mexico-Chile agreement. But conflicts between regional and individual country priorities have hampered serious integration within the region.

Regional Agreements and the FTAA The Summit of the Americas declaration made it clear that the FTAA was to build on the existing commitments of these various bilateral and regional trade and integration agreements. The main challenge is to define how these agreements would facilitate the negotiation of a free trade agreement at the hemispheric level.

The Interim Report of the OAS Special Committee on Trade to the Western Hemisphere Trade Ministerial highlighted three factors that should facilitate the building of the FTAA from these regional agreements: 1) the liberalization process has exposed countries to increased competition and adjustment pressures, putting them in a better position to participate in FTAA, 2) the intensification of trade liberalization brought on by the expansion of such agreements should be considered a step toward hemispheric free trade and could be organized to facilitate that process, and 3) existing agreements could be used as a basis for hemispheric agreement in certain critical areas such as rules of origin, custom procedures, investment measures and transportation.

D THE FREE TRADE AREA OF THE AMERICAS - - CURRENT STATUS

The watershed Summit of the Americas established the concrete goal of creating a Free Trade Area of the Americas by 2005. Since late 1984, there has been forward movement on the 23 initiatives and more than 150 action items endorsed. Progress, though not always even, has occurred during a series of follow-up meetings. Sector-level ministers in trade and commerce, health, labor, energy, and tourism met or were to have met by the end of November, 1995. At the trade minister's Summer, 1995 meeting in Denver, seven working groups met to lay a foundation for the agreement and the U.S. agribusiness community prepared a paper expressing their recommendations for pertinent working groups. The Organization of American States (OAS), the Inter-American Development Bank (IDB), and the UN Commission on Latin America have formed a commission to help coordinate multilateral activities in support of the Summit initiative.

At a recent gathering, a senior National Security Council official commented that while there are many challenges ahead, "the Summit gives us a partnership for collective action, a common platform, and new instrumentality's with which to meet these new challenges head on." (Feinberg, 1995)

E U.S. GOVERNMENT AND AGRICULTURAL COMMUNITY RESPONSE TO ECONOMIC INTEGRATION

Traditionally the United States has preferred multilateral approaches to regional trade agreements, relying on the GATT to achieve trade objectives. In the mid-1980s, however, a shift occurred as the United States became discouraged with progress in the GATT and the rising economies of Asia were causing concern about increased competitiveness. Regional trade expansion was seen as a way of strengthening the competitiveness of the United States in world markets (Josling, 1995). The Clinton, Bush, and Reagan Administrations have all adopted policies to encourage economic integration and free trade in the Hemisphere, although each pursued somewhat different strategies and emphasized varying areas of concern.

Within the agricultural community there has been a mixed reaction. Some in the agricultural community were a part of the opposition to free trade while others were strong supporters. Those whose farm products were protected and those who enjoyed subsidies generally opposed free trade. The American Farm Bureau, agribusinesses, and commodity organizations, which depend on exports, generally supported trade liberalization efforts. Some farm groups are now strategizing as to the implications of economic integration on commodities and sub-sectors.

The 1995 Farm Bill debate in the 104th Congress provided the first opportunity to reshape domestic agricultural programs following the Uruguay Round Agreement and NAFTA. These agreements required the United States and other signatories to meet certain requirements on internal price supports, export subsidies, import access, and phytosanitary regulations. Although the 1995 Farm Bill has not yet been enacted, it is fair to say that these trade agreements have had little impact on negotiations. Instead, the debate was dominated by budget issues and how much to reduce federal spending on agriculture, particularly subsidies. For instance, the conditions

placed on the Export Enhancement Program (EEP), that subsidies be reduced by 36 percent and quantities receiving subsidies by 21 percent, were largely ignored. Rather, the debate focused primarily on how much further to reduce spending on EEP or whether to eliminate it entirely.

F TRADE TRENDS AND DYNAMICS FOR COUNTRIES AND REGIONS

Due to the profound economic policy shifts and subsequent trade promotion efforts, economies are becoming demand driven and interlinked to international markets with the result that agricultural production systems in LAC are increasingly being transformed. Markets now continually signal both new opportunities as well as fading demands. In more open economies, producers face different circumstances every year regarding what and how much to plant, how much risk to assume, and how much to invest in implements, pesticides and fertilizers. Due to the legacy of IS policies in LAC, these decisions were less important parts of the farmer's production process. Today in the more open economies, these decisions are increasingly made at the producer-level, and making them correctly will more directly affect the health of the national economy. Adequate technology and correct market information are increasingly important.

Agricultural production in LAC has begun to respond to recent economic liberalization opportunities. Using data from the FAO's Agrostat database, Annex B graphically illustrates the changing trends in LAC agriculture.⁷ Agricultural production, exports, and imports are shown for the period 1980 to 1994 (the last year of the trade data is 1993), and comparisons against the LAC averages are made. These limited descriptors tell only a partial, but useful story.

In general, Annex B indicates that agricultural production in the LAC region is increasing with trade. Over the period studied, production shows a steady upward trend of about two percent per year. What is important to highlight is that beginning in 1986/88, the period during which the country-level structural adjustment process was beginning to create a more favorable environment for investment in agriculture, the LAC-wide production trend shows a sustained increase over previously observed levels. During this same period, export growth, although erratic, has shown an increasingly upward trend. Agricultural imports, reflecting increased demand and more open economies, have also risen rapidly.

In contrast to earlier sections where aggregate trends and statistics were examined, what follows is a look at country-specific trends and dynamics. Since 1986/88, 15 countries show notable agricultural production increases when compared with prior trends (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Paraguay, Peru, Uruguay, and Venezuela). The standouts in production increases are Bolivia (60 percent since 1980), Chile, Ecuador and Paraguay. The disappointments (disasters might be a more appropriate term) include El Salvador (recovered some since the end of its civil war but still less than 90 percent of 1980 production), Haiti (only 85 percent of 1980 production), and Nicaragua (only now beginning to recover).

⁷ Only countries of over two million population are shown in Annex B.

Countries that successfully increased agricultural production were also the lead exporters of agricultural products. This indicates that access to international markets played a role in production success. Five countries doubled or almost doubled their agricultural exports since 1986/88 (Argentina, Brazil, Chile, Paraguay, and Venezuela), while seven countries showed noticeable increases (Brazil, Costa Rica, Ecuador, Jamaica, Mexico, Panama, and Uruguay). Broken into the sub-regional trade groupings, exports have doubled over this period from all of the sub-regions except the CACM.

During this period, some nations experienced dramatic adjustments and volatile production shifts, particularly in the NTAE commodities. For instance, NTAE exports in Brazil doubled within a two-year period. Costa Rica dramatically expanded pineapple exports while decreasing rice exports. Bolivia enjoyed a one-year boom in earnings from onion exports, and witnessed similar increases in pineapples and coconuts. Peru tripled its exports of fruits and vegetables and, in the MERCOSUR, fruit and vegetable exports have doubled since 1988 (refer to Annex B - Supplemental on page B-10).

A more revealing observation deals with country-level, sub-sector dynamics over the period 1981-1994. These trends may be observed in Annex C which displays, country by country, the production changes, if any, for meat, fruit, vegetables, oilseeds, and cereals over the subject time period. While a direct causal link cannot be drawn, beginning about 1988/89 two major developments may be observed in the wake of expanding trade liberalization policies in many of the region's countries. First, the 15 countries which evidence the most dramatic increases in total agricultural production were those that also showed notable to slight increases in the production of commodities in one or more of the following groups: meat, fruits, vegetables, and/or oilseeds.⁸ Second, at the same time, these same countries showed declines (or at least no major increases) in cereal production. In short, major sub-sector transformations were taking place at the same time that total agricultural sector performance was improving. Generally, the improvement in overall agricultural performance was fueled by sub-sectoral shifts toward higher-valued commodities in response to expanding international market opportunities.

We observed, moreover, that these same countries have more robust economic growth rates than other LAC countries. The average annual GDP increases for the 32 LAC countries was 2.43 percent during 1989-1994, while for these 15 countries the average was 3.3 percent. Of the 10 LAC countries having the largest annual GDP increases over the 1989-94 period, eight countries -- Argentina, Bolivia, Chile, Colombia, Costa Rica, Guatemala, Paraguay, and Uruguay -- were among the 15 countries evidencing the most dramatic increases in total agricultural production as well as increased agricultural diversification into meat, fruits, vegetables, and/or oilseeds.⁹

⁸ This group includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

⁹ The countries with the highest average percentage GDP growth rates from 1989-1994 are: 1) Panama (5.4 percent), 2) Chile (5.3 percent), 3) Costa Rica (4.8 percent), 4) El Salvador (4.8 percent), 5) Argentina (4.1 percent), 6) Guatemala (3.9 percent), 7) Colombia (3.8 percent), 8) Bolivia (3.7 percent), 9) Paraguay (3.9 percent) and 10) Uruguay (3.5 percent) (International Financial Statistics Year Book, 1995: 165).

Market-oriented economic policies have lowered trade barriers both unilaterally as well as through trade agreements. Tariff rates have fallen significantly since reforms were initiated. Annex A (Exhibit 5) shows the average tariff rates before and after reforms in selected LAC countries. Non-tariff barriers have also been widely reduced or eliminated. Despite these advances, a number of exceptions remain, unfettered free trade is not yet a reality.

G CONCLUSIONS

Some of the more salient conclusions that can be drawn from this review are

- Economic integration and more open economies have led to a spectacular growth in trade in the Western Hemisphere, binding nations even more closely together. This interdependency -- probably irreversible -- will likely grow stronger, setting the stage for the Free Trade Area of the Americas.
- The changes brought about by economic integration and trade growth are beginning to have profound implications for agriculture, and this trend will intensify. The transformation from import substitution to trade liberalization is now under way.
- While agricultural production does not dominate the economies of many LAC countries as it once did, it is a vital consideration for trade and development strategies because 1) the agricultural sector employs a large percentage of the labor force both directly and indirectly, 2) agricultural exports are a major and expanding component of total export earnings, and 3) alternative sources of employment for people displaced from agriculture are not currently expanding. In sum, a dynamic agricultural sector could provide important employment generation opportunities and stimulate economic growth.
- The export share of raw agricultural commodities continues to decline both within LAC markets and markets in the rest of the world.
- The relative importance of high-value products, both processed and unprocessed, continues to expand.
- In nearly all countries and trading groups, the degree of export diversification is increasing and will probably continue to do so for an even broader range of commodities and products. Total LAC agricultural production, agricultural diversification and agricultural exports, in particular, have clearly benefited from increased economic integration in the Western Hemisphere.

SECTION II

CURRENT LAC NATIONAL TECHNOLOGY CAPACITIES FOR PROMOTING MARKET-DRIVEN SYSTEMS

As outlined in the previous section, the shift from import substitution to market driven agriculture development activities is now under way. This section will catalogue the region's agricultural technology generation and transfer system's institutional capacity for supporting the large numbers of producers, particularly the small to medium producers who will be affected as broader crop diversification increases. This section provides an overview of the present research, extension and education system (Ag REE), which is followed by an analysis of the program focus, resource base, current capacities, alternative institutional approaches, and recent re-engineering alternative approaches currently under development.

A OVERVIEW OF THE AG REE SYSTEM AND PERFORMANCE

Section I highlighted dramatic agricultural sector shifts in the LAC countries over the past decade, that is, improved agricultural sector performance in the wake of trade liberalization, led by increased production of higher-valued commodities -- i.e., meat, fruits, vegetables, and/or oilseeds. At the same time, however, and as also noted in Section I, the countries experiencing the most dramatic increases in agricultural production were also experiencing declines or at least no major increases in cereal production. While some countries (e.g., rice in Colombia) in the LAC region made progress in the 1970s toward higher agricultural productivity in cereals, the general trend has been that productivity growth in cereals lagged behind other regions of the world. Indeed, most USAID-assisted LAC countries over the past decade experienced reduced per capita food production (see Exhibit 6 - Annex A) and growth in cereal imports (see Exhibit 7 - Annex A). Further, from 1983-92 the LAC region trailed other world regions in growth rates of wheat and corn production (see Exhibit 6 - Annex A).

Partially contributing to the lack of stellar performance in cereal productivity in the LAC region has been the overall weakened capacity of the Ag REE system over time to respond to the region's economic growth needs. LAC countries in debt crisis adopted structural adjustment policies that reduced public sector funding for Ag REE. The immediate and potential negative impacts of this decline in public sector funding for Ag REE were aggravated by a decline in donor funding (see Exhibits 9 through 12 - Annex A).

The root cause of the inability of the LAC region's Ag REE system to respond to the region's economic growth needs and the farmer's need for market-relevant technology lies deeper than the decline in public sector or donor funding for the Ag REE system. The Ag REE system's organization and operations, as well as the general macroeconomic and import substitution policies within the region were also at fault. Section I outlined some of the consequences of the IS legacy. In effect, the policies failed to provide a "demand-driven" incentive for farmers to seek and apply productivity-enhancing technology for commodities having market demand.

The organization and operation of the LAC region's Ag REE system is largely the product of public, private, and donor interventions over the past four decades. This system is comprised of country-specific National Agricultural Research Systems (NARS) which include a country's public sector National Agricultural Research Institute [*Instituto Nacional de*

Investigación Agropecuaria (INIA)] and other public and private sector organizations that engage in agricultural research, extension, and education. The donor community [USAID, the World Bank, and the Inter-American Development Bank (IDB)] played a major role in supporting the development of the region's Ag REE system. This support included funding for U.S. agricultural colleges and universities to provide technical assistance to fledgling agricultural research, extension, and/or education systems in the region. Despite the major investments made to strengthen Ag REE in the LAC region over the past 40 years, there has been significant erosion in the capacities of these institutions to meet producer needs, particularly those of the smaller producers. The organizational model did not provide for private sector participation in establishing, financing, or implementing the agricultural research agenda, or for evaluating the system's response to farmers' technology needs. Agricultural research in the LAC region often lacked strong links with key agricultural subsectors such as producer associations and agribusiness and no local stakeholder advocates of these programs developed.

B OVERVIEW OF AG REE PROGRAM FOCUS

Under the IS policy regimes, national agricultural research programs were too dispersed due to the locally-protected markets. These programs focused on raising agricultural productivity on a broad base of crops as part of a strategy to achieve self-sufficiency in production. For example, Ecuador's agricultural research program was for many years thinly spread across more than 80 crops rather than focusing on important commodities with promising market opportunities within the hemisphere and beyond.

This trend was observed in an Inter-American Institute for Cooperation on Agriculture (IICA) inventory (Lindarte, 1995) of agricultural research capacity in the LAC region. IICA hypothesized "excessive dispersion of efforts in relation to the resources available to undertake tasks adequately, especially in the INIAs" (Lindarte, 1995: 12). This hypothesis was based on the observation, especially during the late 1980s, that the INIAs were conducting research on a growing number of crops. It was common to find INIAs that were attempting to cover more than 50 crops and in some cases nearly 100. The net result of this dispersion of effort is that the LAC region has an average of only three researchers per crop. A recent analysis of the size of wheat research programs in developing and industrialized countries found the number of scientists per program was lowest in Latin America (8.7), an average which was lower than that for all developing countries (10.5) (CIMMYT, 1993: 6). Even if one recognizes that some crops may benefit from greater attention through inter-institutional cooperation, IICA (Lindarte, 1995: 16-17) concluded that the region's research capacity lacks a critical mass, particularly given its agro-ecological diversity. The IICA study found that one-third of all programs and one-half of all researchers are within the INIAs. Of the programs and/or disciplines dedicated to agricultural production (as opposed to resource management, etc.), 32% concerned research for livestock (animal production, management, nutrition, and pastures), 16% for cereals and grains, 13% for fruits, and 10% for vegetables. The relatively low percentage of resources allocated to fruits and vegetables is in sharp contrast to the fact that nearly 75% of the Hemisphere's fruits and over 60% of its vegetables are sourced from the LAC region (FAO, 1992, as cited in Pomareda, 1995: 127).

C OVERVIEW OF AG REE RESOURCES

The potential performance capacity of the NARS during the 1980s was adversely affected by declines in budget support per researcher. Data reflecting this trend emerge in IICA's inventory of agricultural research capacity in the LAC region (Lindarte, 1995)

1 Personnel

IICA identified 43,854 persons employed in agricultural research entities in the LAC region in 1992, 10,724 of these work in agricultural research, a slightly larger number than the estimated 8,522 classified as researchers having at least a basic university degree.¹⁰ The average number of researchers per INIA was distributed as follows: Caribbean (6.3), Central America (85.8), Andean (286.4), and Southern (706). Of the 8,522 classified as researchers, 54 percent had an advanced degree (15.8 percent with Ph.D.s, 38.5 percent with an M.S.), while less than 46 percent had only a basic university degree. In terms of sub-regional distribution, 60 percent of the researchers were located in institutions in the Southern sub-region, while the Caribbean had only 1.3 percent, and the Andean and Central American sub-regions had about 40 percent.

2 Public Sector Expenditures for Agricultural Research

One factor potentially accounting for the lack of an increase in per capita agricultural production during the 1980s was the dramatic decline in public funding for agricultural research and extension during a period when there was limited incentive for private sector Ag REE activity (see Exhibit 13 - Annex A). Pardey and Roseboom (1990:2-4) report that the real expenditure per researcher, between 1961-65 and 1981-85, fell on average, by 7.9 percent in 129 less-developed countries, while the decline in the 20 LAC countries was higher at 8.3 percent.

A closer study of the period to period averages reveals a general contraction in financial support for agricultural research in the less-developed countries during the latter period of the sample. Anecdotal evidence suggests this contractionary pattern of support for public sector agricultural research has continued or even accelerated over the more recent past for many less-developed countries and may even have spread to some of the more-developed countries as well. Average spending per scientist ratios for the [LAC] region as a whole show a widespread and substantial decline throughout the region in the early to mid-1980s. This decline was driven as much by stagnating expenditure levels as it was by a relatively rapid growth in research personnel (Pardey and Roseboom, 1990:2-4).

¹⁰ The overall estimate of researchers in the LAC region was revised by IICA to 10,500, based on supplementary data on research personnel in organizations that did not respond to the survey (i.e., Mexico's INIFAP and CIMMYT as well as several Caribbean research organizations). For example, in the case of the Caribbean, supplementary data from a World Bank report on the CARICOM countries indicated a total of 320 researchers in 25 agencies. It should be noted that this quantitative adjustment was not incorporated by IICA into the tables reporting the survey data but were taken into consideration by IICA in the study's final chapter on the evolution of the agricultural research system in the LAC region.

IICA's data on agricultural research expenditures for 1992 revealed an estimated US\$588 million spent on agricultural research in the LAC region. Excluding investments (14 percent of total expenditures), nearly 76 percent of expenditures were for salaries and less than 25 percent for operating costs, the basic resource from which laboratories can be operated, field plots planted and regular observations made.

The low percentage of agricultural researchers with a Ph.D. in the LAC INIAs reflects the decline during the 1980s in public sector and donor funding for agricultural research (see below). In response, IICA raised the question of how the agricultural research capacity of the LAC region has been affected. To help answer the question, IICA turned to ISNAR data on INIAs (Pardey, Roseboom, and Anderson, 1991:417-18). The following compares ISNAR's estimates (1981-85) with IICA's survey (1992).

LAC INIAs

Source	Time Period	Researchers	\$ Million (1992)
ISNAR	1981-85	9,000	\$1,174.8
IICA	1992	10,500	\$709.0

This comparison suggests that, while the number of researchers increased by almost 17 percent during the 1980s, total research expenditures fell by two-thirds (65.7 percent). In view of technical difficulties in comparing the data sets, IICA adjusted the information (See Exhibit 14 - Annex A). For the INIAs covered in Exhibit 14, expenditures fell by 15 percent while the number of researchers increased by 22 percent. While these figures are not as dramatic as those revealed by direct comparison of the ISNAR and IICA data sets (as above), the result translates as a decline of 40 percent in the expenditure per researcher. This trend is found in all regions covered, most notably in Central America and Mexico, followed by the Andean and Southern sub-regions. IICA concluded:

It is clearly in this weakening of the INIAs that one finds the principal nucleus of crisis in the systems of innovation and agricultural research in the region. The INIAs account for more than two thirds of the expenditures and an even larger proportion of the researchers in the region as identified in the inventory. Even if a more exhaustive coverage of other kinds of entities -- for example, universities and commercial private sector -- would reduce the previous estimate for the INIAs, there is no doubt that the INIAs constitute a key subsector of the national systems for agroindustrial innovation. Thus, the crisis of the INIAs has an impact on the functioning and viability of these systems. It would be difficult for any strategy or policy that seeks to strengthen the arrangements for innovation in the region not to address this problem (translated to English from Lindarte, 1995:28).

3 Donor Funding for Agricultural Research

As a percentage of USAID's total funding for Agriculture in FY88 compared with FY91 (see Exhibits 9 through 12 - Annex A), and as a percentage of total funding for Agriculture and Natural Resources/Environment (the percentages enclosed in parentheses), USAID's funding for Ag REE fell in each of the three functions -- research, extension, and education -- as follows:

USAID Ag REE Spending

	% Research		% Extension		% Education	
FY88	17.4	(14.5)	16.8%	(14.0)	4.6%	(3.8)
FY89	9.2	(7.6)	15.1%	(12.4)	11.0%	(9.0)
FY90	11.3	(9.1)	12.4%	(10.1)	2.3%	(1.8)
FY91	8.3	(3.7)	10.7%	(4.8)	1.8%	(.8)

During the 1980s the World Bank did not emphasize agricultural rural development (ARD) projects that disburse money slowly, but rather structural adjustment loans (SALs) that disburse money more quickly, with conditions for the implementation of specified policy reforms. A reduced level of funds was available for ARD projects. Under pressure to reduce budgets, many developing country governments chose to cut public investments for agriculture rather than reduce urban and industrial subsidies. Many governments found it easier to cut subsidies (raise the price of rural credit and inputs such as fertilizers, and cut the budgets for agricultural research and extension) than to raise commodity prices. Indeed, Paarlberg and Lipton (1991:496) report that LAC agriculture's "already small share of central government expenditures fell by 35 percent in the early 1980s. By allowing its own lending for agricultural and rural development to falter over the past decade, the Bank may have legitimized an unfortunate tendency in the same direction among Third World governments as well as multilateral and bilateral funding sources."

D CURRENT CAPACITY AND PROGRAM PERFORMANCE

LAC Ag REE systems have not been effective in generating and transferring to producers the agricultural technologies required for the region's agricultural productivity to keep pace with the growth in the region's food requirements. The response of public sector agricultural research systems to trends in the LAC region may be illustrated with a representative example, the Government of Guatemala's technology generation and transfer efforts (IICA, 1991). The following example is based on IICA's assessment of Guatemala's agricultural sector.

1 Guatemala's Technology Generation and Transfer Efforts

Compared with the traditional export crops (coffee, cotton, sugar cane, banana) produced under relatively modern production systems, Guatemala's basic food crops have continued to be produced using low levels of technology, resulting in relatively low yield levels. Less than 10 percent of Guatemala's farmers use improved seed in producing basic grains, a limiting factor on increasing the low yields per unit area. Other potential "causes" for the low yields include, according to an IICA assessment, the possible negative effect of large quantities of food aid on basic food crop prices (IICA, 1991) and low public/private investment in generating, adapting, and transferring agricultural technology.

The capacity of Guatemala's technology system to respond to this scenario of stagnant productivity levels in the basic food crops has been limited. IICA concluded that Guatemala "does not have a National Science and Technology System that permits the formulation of an integrated technology generation and transfer policy" (IICA, 1991:27, translated from Spanish).

As a result, the research of Guatemala's Instituto de Ciencia y Tecnología Agrícolas (ICTA) has been concentrated on genetic improvement, especially in basic grains, with the universities playing a relatively minor role in agricultural research. While ICTA has done some research on higher-valued crops (vegetables, fruits, and swine), it has been the private sector that has taken the lead in terms of importing technologies through input suppliers and buyers of export products.

The government supports three public sector agricultural extension entities (DIGESA, DIGESEPE, DIGEBOS). These institutions provide programs for small farmers which have proven not only to be ineffective but also of high administrative cost. Further, the link between these extension agencies and ICTA is weak. Guatemala's technology generation and transfer policy has not achieved the intended results. Public sector credibility as a source of improved technologies has been surpassed by the technology support provided by private agroindustry (inputs and products) for the higher-valued crops such as fruits and vegetables.

The poor performance of ICTA can be traced to a number of factors, including the following: (a) low capacity to adapt to the new requirements for agricultural research, (b) lack of an integrated agricultural research and technology transfer policy, (c) lack of coordination with farmers and extension workers, (d) inadequate technical and administrative capacity for a large percentage of ICTA's personnel, and (e) heavy dependency on external funding. On the other hand, poor performance by DIGESA can be traced to several factors: (a) a "retail-level" orientation to small farmers that has been ineffective and costly, (b) inadequate operating policies, (c) inadequate organization, (d) lack of coordination with other institutions, (e) a shortage of adequately trained personnel, and (f) a geographically dispersed target population.

2 General Assessment

A survey of USAID Mission ratings of host-country Ag REE systems performance characteristics not surprisingly observed "limited progress and frequent inadequacies of public sector Ag REE systems as well as numerous constraints impeding greater system productivity" (Byrnes, 1992: 11). In that survey, the Mission ratings of selected Ag REE system attributes indicated that progress has been greatest for private sector technology generation and transfer. By comparison, progress ratings for public sector Ag REE were consistently lower. Public sector agricultural research and extension were rated below average, while agricultural education, on average, rated lower than the other three categories (private sector agricultural research, public sector agricultural research, and public sector agricultural extension). Missions rated the adequacy of selected aspects (personnel management, program planning, and budgeting) of most public sector agricultural research systems as "poor" to "very poor," although numerically, many were trained for public research and extension.

E OTHER INSTITUTIONAL APPROACHES FOR IMPROVING LAC AG REE PERFORMANCE

1 Nonprofit Private Sector Agricultural Research

USAID support for independent sector agricultural research organizations in the LAC region grew out of an Agency concern in the region to find more productive alternatives to its traditional support of public sector agricultural research. USAID Missions generally rate private sector institutions as having made progress in developing agricultural technology generation and transfer capacity. At the same time the "Sustainable Private Agricultural Research in Latin America and the Caribbean" (SPARLAC) study (Byrnes and Corning, 1995) found that USAID's support for independent (private nonprofit) sector agricultural research organizations did not match this view.

USAID has provided funding to nonprofit organizations through cooperative agreements. These agreements specify how much of a project's funds can be spent on each line item in the project's budget (which, in some cases, is the institution's budget). This often has the effect of creating supply-driven agricultural research, in which the management of these organizations is driven not by the range of market opportunities for which the organization has comparative advantage but rather by the objectives and priorities of the donor organization. USAID has often required that these organizations respond to small-farmer technology needs, but the prospect for these organizations' research programs to become self-sustaining is low without some public or donor support focused to correspond to changing market realities. This is particularly true where the production research continues to focus on traditional cereals.

Small farmers are not in a position to pay a fee for agricultural research services that lack immediate prospects of producing tangible benefits, particularly when the research is focused on relatively low-value basic grain crops. There are limits beyond which private sector interests do not have adequate incentive to provide the funding required to sustain an adequate agricultural research organization (Byrnes, 1995a). This is true even for the higher-valued market-oriented fruits and vegetables for which developmental research is required to source and adapt technologies to production environments.

Some USAID efforts to create independent (private nonprofit) sector agricultural research organizations have had some success (e.g., FHIA in Honduras, FUNDAGRO in Ecuador) but others have foundered (e.g., Costa Rica's CINDE/División Agrícola, Peru's FUNDEAGRO, and Jamaica's JARP). USAID has repeatedly underestimated the time and requirements necessary for the sustainability of these organizations without continuing direct donor subsidization of their operating (or indirect) costs. Other donors are reflecting on these experiences as they now develop appropriate models for sustainable research.

2 Public Sector Agricultural Extension

Declines in funding support for agricultural research also have been accompanied by growing disenchantment with public sector agricultural extension. A recent World Bank (1994) analysis of its portfolio of agricultural extension projects revealed inconsistency in the perfor-

mance of its agricultural extension projects. The analysis included free-standing extension projects as well as projects in which agricultural extension was a component. The performance ratings of free-standing projects reviewed ranged from satisfactory (n=23) to un-satisfactory (n=8). Two of the 31 free-standing projects were in the LAC region.¹¹ Approximately 66 percent of the satisfactory projects and 100 percent of the unsatisfactory projects were rated as having uncertain to unlikely sustainability. This unfavorable projection of the prospects for sustainability was related to a core set of basic constraints associated with productive and sustainable agricultural extension. Major constraints or issues revealed by the analysis are typical of those reported by other studies and are summarized in Exhibit 15 - Annex A.

The World Bank analysis also examined 20 projects in the LAC region in which agricultural extension was a project component. Exhibit 16 - Annex A summarizes the major technical findings associated with these projects. The major agricultural extension issues emerging from this analysis of Bank-assisted agricultural extension projects reflect the same patterns of problems, constraints, and issues reported in the agricultural extension literature [e.g., FAO (1994)]. It concludes that public sector extension can achieve favorable economic returns if

- (a) The private sector is not able to provide alternative, effective forms of technology transfer,
- (b) There is a significant technology gap between current practices and available, more profitable technology relevant to and sustainable in the targeted farming systems, and
- (c) Extension services are relevant and delivered efficiently

While some donor-funded projects have demonstrated the potential "validity" of new agricultural extension models [e.g., Communication for Technology Transfer in Agriculture (CTTA) in Honduras and Peru], they are often unsustainable. These efforts focus on improving extension methods for transferring technology and not on developing sustainable mechanisms for funding technology transfer once project funds are cut off. Improved agricultural technology transfer, whether it is called "agricultural extension" or something else, will be needed if market-relevant technologies are going to reach the LAC region's large numbers of small agricultural producers. As the World Bank noted in its agricultural extension project review "Rapidly changing economic, trade and sectoral conditions will impact on the type of extension services that will be needed, and the respective roles of private and public sector technical assistance will have to adjust to these demands" (World Bank, 1994: ix).

¹¹ The Peru project attempted to integrate research and training and visit (T&V) extension. The project proved unsatisfactory due to many factors including a deterioration in the government, economic, and political environments. The Brazil project supported the national extension service (EMBRATER) through which federal and donor funds were allocated to 25 state extension services. While the T&V system was not used, a group approach to extension and heavy use of small demonstrations were encouraged. Impact has been constrained by a number of factors, including limited state budgets to support recurrent costs (despite initial support through EMBRATER) and the eventual dissolution of EMBRATER, with the extension 'football' subsequently being kicked to EMBRAPA and then to the Ministry of Agriculture.

Reviewing “agricultural extension worldwide” in relation to the emerging challenges and opportunities for agricultural extension in the LAC region, Byrnes (1995b) identified five issues

- Linking extension with research to meet diverse technology needs,
- Narrowing or expanding agricultural extension functions to be market-and client-oriented,
- Exploiting methodological and technological innovations for more effective extension,
- Applying financial and administrative innovations for a sustainable extension system, and
- Mobilizing education and training/retraining to strengthen extension’s technical capacity

3 Agricultural Education

Another constraint on LAC country capacity to serve national economic needs more productively is the difficulty of finding trained personnel at all levels of operations ranging from NTAE production to farm management, agribusiness, and food processing. Funding for agricultural education has declined at even greater levels than agricultural research and extension funding. While some IDB and World Bank projects continued to provide funding support for LAC agriculturalists to obtain education and training at an advanced degree level, USAID support of agricultural education during the 1980s shifted from an emphasis on developing host-country agricultural education institutions (e.g., national agricultural universities) to support of potential regional centers of educational excellence (Pan American Agricultural School in Honduras) and regional agricultural education centers (CATIE and EARTH in Central America and the University of the West Indies in the Caribbean).

These trends have weakened the achievements in agricultural higher education institution building made during the 1950s and early 1960s. With higher salaries in the private sector, there has been a decapitalization of human resources in higher education institutions for agriculture. Even premier agricultural higher education centers (e.g., CATIE) find that a portion of their staff can only be retained with project funding. Few, if any, higher agricultural education institutions in USAID-assisted LAC countries are sufficiently developed to generate the full range of scientific manpower needed by the agricultural sectors of these countries to address rapidly changing needs. Only CATIE offers training at the M.S. level. As Vessuri (1990:1549) notes

Only a few [LAC] universities seriously engage in research and the training of future researchers. Today’s universities must be refurbished in order for them to deliver not only the researchers, but also the entrepreneurs and administrators acutely needed by [LAC] countries. The region’s institutions of higher education need to be improved, strengthened, and strategically led to serve effectively their host societies in the 1990s.

Many LAC agricultural researchers were trained in the 1960s and early 1970s and have received little or no educational updating since their basic training. Even an updating as minimal as post-doctoral training for such researchers could have a high payoff.

F SOME RECENT LAC AG REE REFORM INITIATIVES

Increasingly the Ag REE systems of the LAC countries will be challenged to look outward to 1) help respond to major adjustments and identify market opportunities for agricultural products, 2) assess each country's comparative advantages with regard to those opportunities, 3) organize the production, postharvest handling, and agro-processing systems to meet increased employment generation needs and to tap the income streams resulting from supplying those markets in a cost-effective manner, and 4) help devise strategies and policies that help make the transformation from import substitution to free trade as beneficial as possible. One new challenge will be the capacity of the region's Ag REE systems to conduct "risk assessments" and to provide the science and technology that producers will need in order to meet "quality assurance systems" standards or to establish an adequate system of Hazard Analysis Critical Control Points (HACCP).

A key issue in this challenge is whether these countries will be able to re-engineer their NARS to confront the more complex new requirements. To help assess such prospects, some initiatives involving NARS, private sector networks, NGOs and regional networks which were already under way prior to the proposal for the FTAA are now summarized.

1 Restructuring of NARS

Restructuring of public sector agricultural research and extension systems is taking place in many LAC countries (e.g., Peru, Mexico). The following descriptions of national restructuring give an example of the extent to which the emerging free trade scenario is taken into account.

Ecuador - An external review by the International Service for National Agricultural Research (ISNAR) and *Instituto Interamericano de Cooperación para la Agricultura* (IICA) of Ecuador's Ag REE system recommended that public agricultural research investments be increased to at least 1 percent of agriculture's contribution to the GDP and that major institutional reforms be made in the *Instituto Nacional Autónomo de Investigaciones Agropecuarias* (INIAP). In July 1992, the Ecuadoran Congress approved a law granting INIAP autonomy in administration and budget management and the ability to access state resources. It also provided for an endowment of US\$10 million to generate resources for research operations. As of August 1995, \$5 million had been given to INIAP. A new five-member board of directors was established consisting of two public sector members, two private sector members, and one member from the national university council. A series of organizational, operational and procedural reforms have been introduced. The goal is to generate income to cover 50 percent of INIAP's budget in four years. In 1993, INIAP financed 25 percent of its own budget.

Colombia - Colombia has restructured the *Instituto Colombiano de Agricultura* (ICA) into the private *Corporación Colombiano de Investigación Agropecuaria* (CORPOICA). As part of this restructuring, the private sector is expected to provide capital to fund CORPOICA's agricultural research program. The technology transfer function was eliminated from ICA and assigned to local municipalities under the *Sistema Nacional de Transferencia de Tecnología Agrícola y Pecuaria* (SINTAP).

Chile - Chile's technology system supporting fruit and vegetable production and exports provides an exception to the general trend in the LAC region of deteriorating country-level Ag REE systems. The institutional underpinnings of Chile's success in producing and exporting fruits and vegetables are multifaceted (Barriga, 1990) and reflect a systematic approach to the marketing of horticultural crops. The Chilean case highlights what can be accomplished when the ingredients for successful agribusiness are in place. Descriptions of several components of the Ag REE system identified as crucial to the success of Chile's horticultural industry follow.

Chile's National System of Agricultural Research, which includes INIA and the universities, grew significantly during the 1960-1980 period, with a seven-fold increase in research investment. Chile's investment in fruit production research is second only to wheat, the country's principal crop in terms of area planted and exploits the countries' comparative advantage. Agricultural research funding depends on contributions from the public and private sectors. The Ministry of Agriculture allocates funds to the Agricultural Research Fund (FIA) which selects proposals through a competitive process, recipients of FIA grants are required to contribute private funds to help cover the costs of the research.

Universities have made important contributions to agricultural research, particularly in the area of fruit and vegetable production. Chile's two major universities (University of Chile and Catholic University) offer undergraduate degrees in pomology, while advanced degrees (M S and Ph D) relevant to fruit and horticultural production are pursued overseas. In addition to a core of trained pomologists, the universities as well as Fundación Chile have continued to support the fruit and vegetable export sector through seminars and courses taking advantage of tax deductions allowed by law for this purpose. As Barriga (1990:37) reports "Training has become an important professional activity in Chile. Several specialized training organizations organize activities for which they select and hire the best trained specialists." Catholic University has only limited geographic coverage in terms of agricultural experiment stations but contributes to horticulture market research by producing periodic publications on the economic aspects of agriculture.

The Ministry of Agriculture's agricultural extension program is directed at two target groups: commercial farmers with over 12 irrigated basic hectares through the previously described GTT groups, and small low-income farmers with less than 12 irrigated basic hectares who receive credit and technical assistance from the National Institute for Agricultural Development (INDAP). Most INDAP-supervised small-scale farmers produce traditional crops, such as cereals, legumes, or industrial crops but have achieved significant increases in the production and yield of these crops (Barriga, 1990:33). Chile has a major program of outreach to work with agricultural producers and scientists in other regions having similar agroecological zones (for a discussion of one such program between Chile and Washington State, see Section IV).

2 Networking

The "research network" mechanism offers the potential for accelerating technology generation and transfer by exploiting each network participant's comparative advantage for research. Several networks are coordinated by the three Latin American IARCs: CIMMYT (Mexico), CIAT (Colombia), and CIP (Peru). Also, CATIE in Central America and CARDI (in

the Eastern Caribbean) facilitate research networking in their regions. IICA has fostered a series of regional cooperative programs known as Programas Cooperativas Regionales (PROCIS) providing another impetus for research networks in the LAC region.¹²

3 Increasing Private Sector Participation

Non-Governmental Organizations (NGOs) - NGOs have begun to play an increasingly important adaptive research and technology transfer role in support of agricultural research and environmental (natural resource) management programs. These NGOs range from established international nonprofit organizations to community-level indigenous organizations. USAID-funded projects or grantees (e.g., USAID/Peru PVO Support Project) often retain NGOs through cooperative agreements to implement project activities with research (farm-level trials) and/or extension (demonstration plots) components. Such NGOs generally lack the resources to cover the costs of agricultural research installations (laboratories, greenhouses, experimental stations), to employ highly trained scientists with advanced degrees, or to finance agricultural research over the long term. Partly because of this, the national agricultural research programs (INIAs) may be unwilling or unable to cooperate with such NGOs to the extent required for agricultural technology programs to achieve an impact.

Foundations - During the 1980s, several USAID Missions in the LAC region launched initiatives to foster greater private sector participation in the organizing and financing of agricultural research for NTAE crops. In some cases these initiatives had the more ambitious objective of revitalizing the national agricultural research, extension, and education (REE) system (e.g., Ecuador and Jamaica). In the case of Peru, Fundación Peru reached an agreement with the Peruvian Government to manage and operate four coastal research stations. The foundations that have been successful in capturing sufficient resources to establish an endowment (e.g., FHIA in Honduras) or in developing revenue-generating projects (e.g., Fundación Chile) have shown sustainable capacity to fund and carry out agricultural research.¹³

Commodity-Based Systems for Financing Agricultural Research - Certain producer groups in the region have made progress toward establishing commodity-based systems (or mechanisms) for generating funds to support agricultural research for those commodities. Colombia's *Federación Nacional de Cafeteros* (FEDECAFE) (Cano, 1993) supports its agricultural research programs on coffee and diversification crops with a tax on coffee exports. This same system for financing agricultural research is now used in Colombia by other producer associations for rice, sugar cane, African palm, cotton, flowers, banana, and other commodities.

¹² Additional information on CRIAR networks and on PROCIS is provided in Section III.

¹³ FHIA raised sufficient private sector funds to qualify for PL-480 local currency generations to establish its endowment and the Fundación Chile developed a salmon project which was sold at a profit to the private sector.

A more recent example of a commodity-based system for financing agricultural research is the Latin American Irrigated Rice Fund [*Fondo Latinoamericano para el Arroz Bajo Riego* (FLAR)] Four LAC countries currently participate in this program which channels a percentage of rice sales into a research fund for irrigated rice

4 Regional Innovations

Caribbean Basin Growers Association (CBGA) - Growing market opportunities for nontraditional agricultural export (NTAE) crops, combined with declining funding support for agricultural research in the United States, led the U S private sector to press for a Congressionally mandated "Feasibility Study on the Potential Benefits of Joint Agricultural Research and Education in the Caribbean Region" (Byrnes, et al 1990) Based on this study's recommendations, USAID asked LAC TECH to assist NTAE growers in the Caribbean Basin establish a CBGA which could help NTAE crop producers mobilize funds in support of market-based agricultural research and information programs USAID provided technical support to assist in starting the CBGA, but the Agency did not have the budget resources in 1992 to partially fund the organization and the initiative stalled

Regional Fund for Agricultural Technology - The IDB is currently working with the LAC countries to establish a Regional Fund for Agricultural Technology (IDB, 1995b) to fund a competitive research grants program At a US\$200 million capitalization level, based in part on member contributions of IDB loan funds, the fund would generate an annual return of approximately US\$10 million to be used for program and operating costs The fund's objectives are (a) to increase (and ensure the continuity of) resources devoted to generating priority technology for LAC countries by national, regional, and international organizations, (b) to increase the participation (including decision making and management) of LAC countries in regional and international agricultural research activities, and (c) to increase competition between the various organizations that implement priority research projects As proposed, the fund will strengthen regional consultative mechanisms in strategic research activities, in order to complement the applied and adaptive research conducted by national institutes It will also strengthen coordination with other research-financing agencies to maximize complementarity in research efforts The IDB is working toward a 1996 startup of the fund

Consortium of Inter-American Agricultural Foundations (CIFA) - IICA sponsored the preparation of a draft proposal for a *Consorcio Interamericano de Fundaciones y Organizaciones Privadas de Apoyo a la Investigación Agrícola* (CIFA) (IICA, 1994) This study reviews the status of the various agricultural research foundations in the LAC region, proposes the creation of CIFA, and defines CIFA's mission as that of strengthening the capacity of the foundations to advance technological innovation and agricultural development in the LAC countries The CIFA initiative currently remains at the proposal stage

G CONCLUSIONS

Section I provided several important conclusions and future implications concerning the agricultural sector's response toward trade liberalization policies. These conclusions are now considered in conjunction with the LAC region's Ag REE system. The key conclusions regarding hemispheric trade developments are (1) the opening up of country-level LAC economies has led to a spectacular growth in trade in the WH and increasing economic integration of trading partners, (2) agriculture, which employs a large percentage of the labor force and constitutes a major part of total export earnings in the LAC countries, is becoming an important component of trade and development strategies, (3) while the export share of raw agricultural commodities continues to decline within LAC markets, the export market for high-value products (both processed and unprocessed) is continuing to expand, and (4) generally, export diversification is continuing to grow with less dependence on a limited set of products.

These conclusions reflect the reality that the agricultural sector in LAC countries is now undergoing a major transformation which is increasing market opportunities for producers to shift their factors of production (land and labor) into higher-valued crops or, more generally, into market-oriented production, postharvest handling, agroprocessing, and marketing systems. These markets and other new market-oriented opportunities, however, generally entail higher capital costs and risks and cannot be cultivated if the producers do not have ready access to appropriate technologies and related management and marketing skills.

Small- to medium-sized agricultural producers of the LAC region have generally not had equitable access to agricultural technologies that are appropriate to these changing production environments. Ag REE systems in the LAC region, operating over the past few decades under a less competitive, inward-focused "import substitution" environment, were unable to provide technologies needed by large numbers of producers even in helping address national food requirements. The National Agricultural Research Systems (NARS) of the LAC countries have been poorly positioned to respond to producers, particularly those smaller producers. For example: 1) Increasing opportunities to meaningfully assist in the diversification process are ignored because of the limited capacities and abilities related to an increasing number of NTAE crops. 2) Broader needs related to postharvest processing and enterprise management are not being addressed, as a result, opportunities to increase vital rural-based employment are not being fully realized. 3) The opportunities for the Ag REE system to assist in determining changing market needs and undertake legitimate roles regarding matters of national policy and public service interest are being ignored.

The LAC region's Ag REE systems are now at a crossroads. As indicated in Section I, the opportunities for small- to medium-sized agricultural producers to capture increased income from agriculture do not lie in the cereal crops. Adoption of productivity-increasing technologies can, however, potentially help these farmers lower per-unit production costs, improve nutrition, and lay the basis to reallocate available land and labor production resources into higher-valued, more market-oriented crops that hold greater potential for increasing agricultural incomes. The new agricultural sub-sectors being pursued throughout the region offer considerable opportunities for increasing incomes and improving both on- and off-farm job opportunities.

Now, with the prospect of the FTAA being established in ten years, appropriate institutional and support capacities and agricultural technology systems need to be assembled and put in place. The newer and greater challenges which are now occurring will need to be overcome. Of particular concern will be the task of aiding in the transformation of small to medium-sized operations so that they can compete in the growing, postharvest handling, agroprocessing, and marketing of high-value crops, as well as helping these enterprises develop or expand their off-farm pursuits.

While some new approaches are being reviewed on a variety of fronts, this chapter's review of the current Ag REE systems concludes that the nationally based models are not sufficiently positioned or supported to respond to the new and more complex challenges. The capacity of the "re-engineered" country-level NARS (Ag REE systems) to meaningfully contribute to the opportunities provided by the emerging free trade scenario will greatly depend not only on increased national support, but also on the ability of appropriate international, regional, and U.S.-based institutions to come forward with the pertinent leadership, financial, and technical support. The current capacities of such institutions to respond to the emerging free trade environment is addressed in Section III.

SECTION III

INTERNATIONAL, REGIONAL, AND U S.-BASED CAPACITIES FOR FACILITATING TECHNOLOGY CHANGES SUPPORTIVE OF NEW MARKET-DRIVEN DEVELOPMENT IN THE WESTERN HEMISPHERE

LAC Ag REE national programs have generally not provided the contributions needed to address changing production requirements for maximizing new economic growth opportunities. In response to a series of national economic reforms and bilateral and sub-regional trade agreements, economies are growing and major shifts are taking place within the agricultural sectors. This transformation will no doubt accelerate over the next decade as the FTAA process unfolds. Given the importance of the agricultural sector for increased sustainable growth in the hemisphere, Section II concluded that new approaches for providing appropriate technologies will be necessary.

This section presents a general overview of the programs and activities of the most important international, regional, and U S -based institutions which may be elements of a more appropriate agricultural technology system. The institutional bases reviewed are: 1) International Agricultural Research Centers, 2) The World Bank, 3) The Inter-American Institute for Cooperation on Agriculture, 4) The Inter-American Development Bank, 5) USAID, 6) USDA, 7) U S land grant colleges, 8) PVOS, and 9) agribusinesses.¹⁴ The possible strengths and limitations of each institution to help producers respond to the opportunities of trade liberalization will be analyzed.

A INTERNATIONAL AGRICULTURE RESEARCH CENTERS (IARCs)

1 General Overview of the IARC System

The IARCs have been the institutional cornerstone for conducting strategic and basic research on global food crops, forestry, livestock, policy, and institutional needs. Since 1960, 16 centers have been created to support the National Agricultural Research Systems (NARS). By operating at significant economies of scale, they have helped introduce numerous varietal improvements around the world. Building from their initial successes introducing Green Revolution technologies in the 1960s, an IARC coordinating body consisting of 49 donors, the Consultative Group for International Agriculture Research (CGIAR), was created in 1971. The CGIAR helped focus the IARCs and their 1,000 scientists to respond to changing global priorities. For an overview of the core CGIAR network, refer to Exhibit 17 in Annex A.

During recent years, the CGIAR has begun to respond to increased pressure to deal with natural resource management issues, such as forest, water and marine resource concerns, as well as those of sustainable agriculture. Amplifying the stress on the system are recent major budget limitations. The most important funding reduction was the U S Government's \$14 million annual

¹⁴ The United Nation's Economic Commission for Latin America and the Food and Agriculture Organization provided some very useful materials for this report, but given their broader mandate, will not be included here.

donation cut which sparked other donors to reconsider their support during the early 1990s (GREAN, 1994). Since then, significant program adjustments have occurred -- some centers have released senior international scientists while other IARCs are undergoing major restructuring.

In response to these adjustments, a series of "milestone activities for system renewal" were initiated in 1994. To help refocus the CGIAR, a new vision statement was developed and new "partnership" initiatives were proposed to link the CGIAR and the IARCs more directly with 1) the private sector, 2) the NGO community, and 3) the NARS. Furthermore, the IARCs are establishing collaborative links with public, private, and university organizations, including "North/South" institutional "partnerships." In order to coordinate the movement, a "Private Sector Advisory Group" will be organized. CGIAR's new research priorities will be focused around five areas: 1) increasing productivity, 2) protecting the environment, 3) saving biodiversity, 4) improving policies, and 5) strengthening the NARS. In essence, productivity and natural resource management are the new "twin pillars" of CGIAR research (CGIAR, 1995: 6). As a result of the structural and strategic reforms, as well as the new actions related to governance and program financial management, funding has been "stabilized." In fact, CGIAR funding levels have increased in recent years (although not in real terms) and the 1994 budget was \$265 million (CGIAR, 1995a: 27) or about 4 percent of the total agricultural research expenditures for developing countries (GREAN, 1994: 10).

The most relevant CGIAR publication pertaining to the TIAFTA agenda is the new vision document, Sustainable Agriculture for a Food Secure World. Among other themes, this document stresses the need to dramatically increase production through technological changes. Such improvements will not only increase yields, but will also increase employment from farm product processing and related agricultural activities. The document asserts that employment and income needs in the increasingly stressed rural areas will have to be addressed through agricultural development and the appropriate exploitation of adjacent natural resources (CGIAR, 1994: 31). Without incorporating these strategic dimensions into new IARC programs, the benefits of economic and trade liberalization policies now under way may fall short of expectations. As a consequence, governments may be forced to backstep from the important market-orientated approaches now being introduced (CGIAR, 1994: 35). The CGIAR vision statement concludes: "It is not simply a matter of meeting the market demand for food. The new mandate is to assure food security for all the world's population through agricultural research that not only adds to food production but generates employment and income that, in turn, increases the market demand for food." (CGIAR, 1994: 61).

While 12 IARCs work in varying activities in the LAC region, only those IARC programs with agendas particularly relevant to the TIAFTA study were examined.

The International Center for Wheat and Maize Improvement (CIMMYT) was established in 1966 to help increase the productivity of maize and wheat. Important contributions throughout the world have been made, particularly under the wheat program. CIMMYT's services will be important for both cereal crops as the trade liberalization process continues since both are, to varying degrees, vital throughout the Hemisphere. For example, given the extensive use of maize based systems for small farmers throughout most of LAC, anticipated major adjustments will require special programs and strategies. Wheat is generally not extensively produced by

small farmers in LAC, except in Chile and by pockets of producers in the Andes. The CIMMYT program does, however, provide an important role in global wheat production. Not only does it provide considerable new wheat germ plasm to the Hemisphere's largest producers, but most of the improved wheat varieties throughout the world have also been derived from CIMMYT germ plasm.

Both CIMMYT commodity programs have introduced new initiatives for more efficient outreach. Recently, the maize program has compiled extensive information from which more direct interactions with the private sector seed industry can be initiated (CIMMYT, 1994). The wheat program is beginning to build from their very productive and extensive international networks (which include considerable United States linkages) to develop recommendations for "rationalizing" NARS staffing levels so that their scientific research can be done more efficiently. CIMMYT research has found that significant economies of scale may be achieved in wheat breeding programs (CIMMYT, 1993).

The International Tropical Agriculture Center (CIAT) was established in 1967 to promote germ plasm development in beans, cassava, tropical forages, and rice for Latin America. CIAT was the first IARC to change from a commodity-based program to one based on multidisciplinary eco-regions. Their focus is on the increasingly fragile hillsides and the tropical lowlands. An innovative program for generating additional funding for rice research to meet the needs of farmer organizations and respective private sector suppliers has been developed by CIAT. *El Fondo Latinoamericano para el Arroz de Riego (FLAR)* [Latin American Fund for Irrigated Rice], and was introduced with private sector representatives from Brazil, Colombia, Uruguay, Venezuela and other nations (FLAR, 1995). In addition, CIAT has developed methods for organizing farmer-run enterprises for cassava processing and seed multiplication.

The International Food Policy Research Institute (IFPRI) was founded in 1975 to analyze and identify agricultural policy constraints. IFPRI's research agenda focuses on policies dealing with accelerating agricultural growth, natural resource management, household food security, macroeconomic reforms, and trade policy. The latter unit concluded that the developing country's capacity for trade policy analysis work ranges from medium to low (IFPRI, 1993). As a result, special agricultural trade analysis work in LAC began in 1994. The work is funded primarily by the IDB, ECLAC, and the Ford Foundation with modeling work done at the University of Minnesota and Stanford University. IFPRI has also completed some producer-level research addressing the effects of recent trade liberalization policies on small farmers. IFPRI, however, has had limited posting of staff in the LAC region.

The IFPRI paper, Foreign Assistance to Agriculture: A Win-Win Proposition, has made an important contribution to the TIAFTA Study. It demonstrates that as poorer countries increasingly invest in agricultural research and target agricultural development programs, they buy more goods, including agricultural products, from developed countries. Indeed, of all world regions, the LAC region shows the largest increases in total imports for each additional dollar increase in agricultural output and each additional dollar increase in agricultural research.

**Value of Additional Imports Generated Annually by a US\$1 Increase in
Agricultural Output and Agricultural Research**

	<u>Agricultural Output</u>		<u>Agricultural Research</u>	
	Total Imports	Ag Imports	Total Imports	Ag Imports
All Countries	0 73	0 17	0 29	0 07
<i>By Region</i>				
North Africa/West Asia	0 57	0 11	0 23	0 04
Sub-Saharan Africa	0 57	0 18	0 23	0 07
South Asia	0 12	0 18	0 05	0 01
East Asia/Pacific	0 84	0 01	0 34	0 46
Latin America/Caribbean	1 13	0 36 ¹⁵	0 45	0 14

The International Service for National Agriculture Research (ISNAR) was created to strengthen the IARC system. Major limitations in the NARS adversely affected IARC effectiveness, particularly in terms of institutional planning, organization, and management practices. In response, the CGIAR created ISNAR in 1980 to address these problems and thus help foster more sustainable NARS institutions. Due in part to IICA's presence in the region, ISNAR has provided less technical assistance support for LAC's NARS than in other regions. A proposal to strengthen the NARS of the larger LAC countries is being proposed within ISNAR. The initial impression is that the more market-driven institutional approaches and program strategies now required for LAC have not been incorporated within the ISNAR research agenda. Some new concepts for designing agricultural technology support systems beyond the NARS may, however, relate to the new LAC needs (ISNAR, 1995).

2 Elements of the IARC System of Special Relevance to Emerging LAC Needs

The LAC countries have confidence and trust in the IARCs. Based on the numerous contributions observed throughout the LAC region, the IARCs enjoy a high degree of credibility (CIAT, 1995). The most dramatic example of this was the strong request for IARC support made in March during a meeting of LAC Ministers of Agriculture at the International Potato Center (CIP). The Ministers requested help from the IARC Directors to respond to the growing fears of increased competition expressed by small farmers in the region.

CGIAR's new vision statement provides a seed for introducing change. While CGIAR focuses on the production of major food crops, the additional challenges of trade liberalization will create different support needs. Though limited, CGIAR's new statement provides the rationale for the CGIAR system to more directly respond to the changing, market-based trends on a global basis. Furthermore, this statement encourages the IARCs to embrace new North/South linkages between the NARS, universities, NGOs, and private sector organizations. Such linkage activities are strongest within the university community where 66 U.S. universities currently have ties with the IARCs, and efforts are being made to expand their capacity to provide more cost effective "upstream" research services. Regarding the NGOs, a CGIAR/NGO working group was

¹⁵ See Pinstrup-Andersen, et al, pg 11, Tables 4 and 5

recently formed to address this task. On the other hand, there does not appear to be much progress towards forging links with the private sector. Given both the consensus-building decision-making process of the CGIAR and its limited funding base, some time may pass before significant steps are taken to support the new initiatives.

Special new programs for corn and bean producers could help address new needs. Corn and bean production systems are the most commonly employed by small farmers throughout much of LAC and will be under particular stress as trade liberalization expands. The new hillside-based joint CIAT/CIMMYT program to be started in 1996 could serve as one important focal point for generating new technologies and programs which "soften" the transformation process for a portion of the many producers who will be directly affected by providing some with technologies for reducing unit costs of production while enhancing the natural resource base.

An extensive number of commodity and thematic based networks are supported by the IARCs. Apart from the commodity-specific networks, the centers maintain a variety of programs relevant to topics of increased importance such as integrated pest management, sustainable agriculture, post-harvest technology, biotechnology, food science, water management, etc. Many of these are linked with U.S. research centers such as the Collaborative Research Support Programs (CRSPs) and the Oregon State University/Wheat Growers Program with CIMMYT, and others (Plucknett, 1990).

3 Potential Limitations for IARCs to Respond to LAC's Rapidly Emerging Needs

The CGIAR research mandate and funding constraints do not facilitate "NARS strengthening." The CGIAR research priorities make it difficult for the CGIAR to more directly support NARS outreach work. Each center responds to this issue in different ways. For example, during recent external reviews, CIAT was praised for its work with the FLAR project, while CIP was requested to disengage from NARS technical assistance activities (CGIAR, 1995a: 49). Further, the CGIAR financial assistance to directly strengthen national programs has decreased as have the amounts provided to strengthen institutional networks (CGIAR, 1995b: 36).

The IARCs lack sufficient policy and institutional analytical expertise. While IFPRI has dedicated important initial support to some of the trade-driven issues affecting agriculture, more assistance in this complex new area probably needs to be provided. Key areas requiring attention appear to be macro-policy making, sectoral trade linkages, modeling analysis, alternative development strategies, and formulating methodologies to help assess country-level agriculture comparative advantage options. Regarding ISNAR, the changing national-level fiscal and economic environments in LAC require that the LAC NARS adopt both different institutional, structural and operational approaches as well as a broader range of agricultural technology institutional linkages than is usually observed by the NARS. Lessons learned relevant to new market-driven systems need to be quickly disseminated and applied.

The IARCs financial limitations have consequences While the funding situation for the CGIAR may have stabilized, past reductions have taken their toll. One study concludes that given staff reductions, the Centers do not have sufficient disciplinary depth to conduct research to confront increasing demands (GREAN, 1994: 2-11)

B THE WORLD BANK

1 General Overview of the World Bank Program

Over the last decade, the World Bank has become the largest and most influential donor in the agricultural sector, and within the REE sub-sector. During this period, however, the percentage of its portfolio dedicated to agriculture declined from around 30 percent in the 1970s to around 17 percent in 1990 (World Bank, 1991: 1). While similar reductions have been observed throughout the donor community, they have not been as large in terms of proportions to total lending (Binswanger, 1995: 17). Marginal reversals of this trend have recently been observed due in part to the increased importance the Bank is placing on natural resource management.

The Bank's first significant Ag REE activities began in the mid-1970s, since then, these activities have expanded to cover the world. On average, 5.7 percent of the annual agricultural and rural portfolio the Bank has gone to Ag REE activities (IFPRI, 1989: 19). Since the mid-1980s, however, the percentage has declined (World Bank, 1991: 4). In general, most Bank assistance in LAC was targeted to those countries in which USAID did not have a large project portfolio (Byrnes, 1992: 36).

Over the last few years reorganization and staff reductions have diminished its central and LAC regional capacities to influence sector policies and strategies. Staff reductions appear to have caused the task managers to increasingly concern themselves with project operation and management, and less with strategic planning needs. Furthermore, increased attention has been directed to support environmental and natural resource management concerns.

In the 1990s, the Bank became aware that rural poverty was increasing. As a result of the IMF-led structural adjustment agenda, investments in the rural sectors were shrinking in each country. To help begin reversing these trends, Bank staff prepared a new vision statement: A Strategic Vision for Rural, Agricultural, and Natural Resource Activities of the World Bank. The document concludes:

The overall challenge is to persuade multilateral institutions, governments and other donors that major policy and institutional changes are still required to realize the growth and poverty reduction potential of rural areas; that the below-average project record of the past can and is being improved; and that the decline in public expenditures in rural areas must be reversed. Fundamental lessons have been learned, at great cost, about what not to do and what might be done better. Employment-intensive agricultural growth is the engine without which rural welfare, and the management of natural resources, cannot improve. Obtaining rapid agricultural growth and thereby providing the necessary conditions for reducing rural poverty and reversing natural resource depletion and degradation is the Bank's major objective. Realizing these beneficial outcomes also requires effective programs in targeted poverty reduction and more sustainable natural resource management. (World Bank, 1995: 17)

Several World Bank publications demonstrate a growing interest and knowledge base in the area of agricultural transformations within more competitive economic conditions (See C Antholt- Getting Ready for the 21st Century Technological Change and Institutional Modernization, S Barghouti, et al -Trends in Agriculture Diversification, D Gisselquist-Import Barriers for Agricultural Inputs, M McMahon-Getting Beyond the "National Institutional Model" for Agriculture Research in Latin America, S Tabor-Agricultural Research in an Era of Adjustment, and W Zijp, Improving the Transfer and Use of Agriculture Information)

At the staff level, a consensus is emerging that new strategies and approaches are urgently needed to provide new systems for information and technology generation and dissemination. Considering the sizable displacement of farmers, particularly small and medium producers, and the absence of alternative employment opportunities, a consensus that the generation of both on- and off-farms jobs is vital. Two priority areas emerged: 1) to improve production capacities of NTAE-based farm enterprises and related packing and processing functions, and 2) to develop the capacities of mixed farming operations (agro-pastoral, agro-forestry, etc.) located in more favorable agro-ecological environments where employment can be increased. Both should be in response to market opportunities and should help those displaced in the more isolated, marginal areas where a considerable number of the poorer populations reside. Special strategies will be needed to include the appropriate use of adjacent range, aquatic, and forest resources, particularly for the large numbers of traditional cereal producers who, in at least the short run, will not easily find employment from other sectors. Environmental sustainability concerns were also mentioned as a high priority.

Most officials we visited would concur with the opinion of a prominent senior-level strategist who flatly stated that the "LAC agricultural sector is in crisis." Several commented that U.S. leadership is needed to develop agile mechanisms for accessing U.S. technologies, expertise, and businesses, and all agreed that new strategies and systems are urgently needed for both the affected countries and the donors.

2 Elements of the World Bank Program of Special Relevance to Emerging LAC Needs

There is a growing awareness that successful trade liberalization requires more concerted attention toward making small farmers more competitive. While the empirical evidence does not yet clearly indicate appropriate approaches for strategic initiatives, there is mounting interest that concerted steps be quickly taken. If such steps are not taken, it is likely that economic liberalization attempts will fail as a result of political and social pressures.

Some new REE initiatives are now being introduced. After a decline in Ag REE support, some new activities are being developed. An innovative new project in Colombia, which involves a competitive grants mechanism, offers one possible approach. Moreover, designs of new programs are under way in Bolivia, Peru, Jamaica, Ecuador, Chile and Brazil. As these important activities evolve, it will be important to allow national and regional competitive advantage considerations to guide program design, while appropriate private sector linkages are also incorporated.

The Agriculture and Research Extension Group was recently created To better respond to the changing needs of the NARS, the Bank formed the Agriculture Research and Extension Group approximately 18 months ago. This group is responsible for global systems analysis, systems building, and formulating joint donor activities. The staff is comprised of 13 members and includes representatives from USAID, the U.S. academic community, European donors, and people knowledgeable of Ag REE regional support in the Special Program for African Agriculture Research (SPAAR) (World Bank, 1995).

3 Potential Limitations on World Bank Responses to Emerging LAC Needs

Regional trade-based on comparative advantage will require broader analytical capacities Currently for agricultural programs, Bank procedures build from country-level issues. The new economic environment requires knowledge of sub-regional and regional markets, trading policies, strategies related to maximizing rural employment needs, and new institutional approaches to help ensure farmer competitiveness. A new sub-regional strategy planning activity is under way to help provide a first ever effort to better link some aspects of regional trade to national policy decisions. This pilot exercise, however, has not factored technology issues within their agenda.

The Bank has limited access to U.S. agricultural sector institutions and funding mechanisms Bank officials commented that USAID has a history of utilizing relevant skills from universities, PVOs and the private sector. In prior years, the Bank effectively utilized such expertise by collaborating with USAID, today this mechanism has eroded. The lack of adequate mechanisms to provide non-reimbursable support to governments so that they can acquire such services also limits Bank activities.

C THE INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE (IICA)

1 General Overview of the IICA Program

IICA was founded in 1942 in San José, Costa Rica, as a specialized agency for supporting hemispheric agriculture. IICA is part of the Organization of American States and is supported by 33 member states and a large number of donors. IICA's governing board consists of the Hemisphere's ministers of agriculture. The staff of almost 500 national and international specialists are assigned to country missions where a variety of technical assistance and training activities are provided. The 1994 total budget was almost \$79 million (IICA, 1994c: 47). The USDA manages the USG's core budget contribution which will be 10 percent less in 1995 than it was in 1994 and some member countries are in major arrears. The IDB provides funding to support five sub-regional Cooperative Programs for Research and Technical Transfer (PROCIS) which provide a decentralized capacity throughout LAC to facilitate regional technology coordination, and also coordination with the IARCs, World Bank, FAO, and IDB.

With the arrival of a new director general in January, 1994, a major reorganization was instituted and personnel were reassigned to new regional offices, and shortly thereafter, the 1994-98 mid-term plan was developed. The reorganization will promote a more decentralized structure.

and will reflect the specific characteristics of each region so that relevant public and private sector institutions can be better supported. Five regional "directorates" -- Central, Caribbean, Andean, Southern, and Northern -- were established. The largest is the Southern directorate which has a total staff of 221 (152 are assigned to Brazil). An interesting facet of this new organization is the new Northern Region Office in Washington, D C , which will facilitate linkages with appropriate centers of technical and financial assistance and will monitor the development of GATT, NAFTA and other agreements (IICA 1994b 32). In addition to the traditional liaison services earlier provided from the Washington, D C , office, provision will be made for the "Agro Futures Foundation" which will have the specific mandate to generate financial support from the private sector and university communities.

Under the 1994-98 plan, the general objective is focused around sustainable agricultural development within the context of two closely linked strategies:

- 1 "Transforming agriculture's production and trade processes to make it more competitive in order to make it meet the needs of the present generations, while at the same time promoting sound natural resource management and environmental protection, and

- 2 Institutional transformation for developing an organizational arrangement characterized by a) a new public function for the public and private sector, and b) a new cooperative attitude within each sector and between the two" (IICA, 1994b 33)

In order to operationalize this plan, IICA's program activities will be concentrated in the following main areas: 1) socioeconomic policy, trade, and investment, 2) science and technology, natural resources, and agriculture, 3) agricultural health, and 4) sustainable rural development. During 1994, trade liberalization support and activities were addressed by the first two program concentration areas via a small number of research activities, workshops, and training activities which dealt with some aspects of agricultural competitiveness during trade liberalization. They addressed various aspects of agricultural competitiveness and trade liberalization. The second area, the science and technology component, is conducting a similar array of start-up activities in conjunction with the complementary IDB-focused PROCIS programs assigned to each IICA regional office. The major emphasis at the country-level focused on developing new agricultural research and extension systems which included linkages with regional programs, networks or international relationships (most were public sector). The most substantive of these took place in Chile where a framework for modernizing the sector by improving private/public sector relationships was designed, studies on possible impacts of NAFTA were carried out, and an initial meeting of the Chilean Agroindustrial Entrepreneurs took place (IICA, 1994c).

Recent activities and publications such as the "Economic Integration in the Western Hemisphere Symposium" held with the International Agricultural Trade Research Consortium in San José, Costa Rica; the "Agribusiness and the Americas Workshop" in Miami; and Eduardo Trigo's *Libre Comercio, Integración y Agricultura en Centroamérica* [Free Trade, Integration and Agriculture in Central America] all appear to be promoting movement toward market-based technology development and utilization systems. Eduardo Trigo provided one of the most compelling written comments dealing with the importance of technology change.

The concrete fact is that in this discussion of the process of opening markets and trade liberalization, the technology theme very rarely appears. The great emphasis is toward knowing what is going to happen with subsidies, how the exchange rates should be adjusted, and what is going to happen regarding other macro economic variables. The technological theme remains understated and consequently we run the risk of repeating the past by employing technologies which in the near future will not be relevant.

For that reason, agricultural technology is a theme that we must specifically discuss and with much more depth than what has been discussed until now. Because in the final analysis an open economy competes armed with technology. Without taking this into consideration, the benefits which one can obtain due to our competitiveness in the area of natural resources are going to be transitory and quickly eroded due to our inability to be competitive with the changing markets (Trigo, 1993: 73).

2 Elements of IICA's Program of Special Relevance to Emerging LAC Needs

IICA Representatives have a permanent presence in every LAC country. Usually a senior-level agriculturalist represents IICA in each country and they generally have a broad base of country specific knowledge (although the depth of representative knowledge varies from country to country). These representatives also enjoy good professional relationships throughout the agricultural sector, particularly with public-sector institutions.

Some emerging program elements are supportive of market-based trends. There appears to be a strongly stated commitment toward a series of activities which support the LAC countries in the trade liberalization process. Some of IICA's field work, workshops, and publications demonstrate this evolution, however, no comprehensive strategic plan regarding this new orientation was reviewed, nor were there specific project activities designed to respond to the new technological challenges throughout LAC.

Association with the PROCi offices could help IICA meet new LAC needs. The placement of the newly created five regional offices, i.e. "directorates," in the same country as the five PROCi offices will provide an opportunity for broader sub-regional Ag REE coordination. We conducted a limited survey of the PROCi offices and although not all participated, we were generally impressed with the information received.

3 Potential Limitations for IICA Response to LAC's Rapidly Emerging Needs

Institutional capacity could be one major constraint. The major reorganization and program transformations under way will take time to consolidate. Furthermore, current budgetary constraints, personnel vacancies or shifts in key positions, and long institutional ties with mainly public sector institutions, will all probably constrain, at least temporarily, IICA's capacity to undertake a more comprehensive support role for agricultural technology institutions. Much of the staff commented that the staffing capacities may limit IICA from meaningfully supporting bold initiatives.

D THE INTER-AMERICAN DEVELOPMENT BANK (IDB)

I A General Overview of the IDB Program

IDB support of Ag REE began about 20 years ago with levels of support totaling over \$1 billion approximately \$863 million for national and \$182 million for regional and international institutions Funding levels from the period 1980-84 were \$49 million per year, but fell to \$26 million per year from 1985-90 Recently, however, funding levels have been increasing The principal focus of aid has been on maize, wheat, potatoes, cassava, rice, and pastures Support to the regional and IARC programs also declined over the last decade (IDB, 1995b 3) Most of the IDB's country-level programs traditionally supported various INIA-like models In response to some of the changing needs and budget realities, some newer approaches are under discussion

The IDB has undergone a major reorganization which has had a direct impact on its agricultural program Most of the agricultural staff was assigned to three geographic-based operational units where considerable time and effort was devoted to project-specific operational and implementation issues Limited attention and capacities were focused on regional or sector-wide strategic planning issues partly because of unit mandates and staffing limitations

IDB staff consulted were extremely supportive of the importance of continuing trade liberalization policies and directly addressing the special challenges which confront the agricultural sector They felt that alternative employment and purchasing power enhancement strategies which target the agricultural sector will be critically important elements of any sustainable trade-based growth strategy Consequently, agricultural strategies must go beyond simply defining programs in terms of productivity concerns within environmentally sustainable systems, they must also maximize employment generation opportunities through value-added activities At the same time production technologies which reduce unit costs of production should be promoted as well as special strategies to employ the traditional cereal producers who will be displaced by the modernization process There is a need to better understand changing market demands, farm-level dynamics, and draw on the lessons learned about how to effectively position programs for these changing times Two new projects with region-wide implications include 1) the introduction of non-traditional agriculture export projects into their portfolio, and 2) the establishment of the Regional Fund for Agricultural Technology (RFAT - Section II also discussed this program)

The IDB is currently examining the lessons learned by USAID during their 15 year support of NTAE projects for appropriate responses to the new economic conditions The IDB requested a summary of their experiences and, although the Agency has chosen not to continue its activities in this area, it did commission the LAC TECH Project to provide an analysis of past programs LAC TECH produced the summary report "The Case for NTAE's The Rationale for Inter-American Development Bank Investment in Nontraditional Agriculture Exports " This report found that USAID's NTAE programs produced favorable rates of return, a beneficial impact in terms of equity issues, and progress on eliminating environmental problems associated with NTAEs (LAC TECH 1995) Currently, the Bank's first NTAE initiative is under way in Jamaica The IDB staff reported that linkages with U S technologies and agribusinesses will have to be expanded if this new program is to be successful

The IDB, moreover, has proposed an endowment fund to annually generate \$10 million to address strategic regional research activities based on regional priorities (which will presumably embrace changing market opportunities) The proposal is presently under intense review by a multi-donor group of experts Major donors are concerned that this proposal reduces IARC support to LAC, a region already receiving disproportionately less support than Africa or Asia

2 Elements of The IDB Program of Special Relevance to Emerging LAC Needs

There is a growing recognition that within this more competitive environment sustainable hemispheric development is linked to some farm-level transformations Throughout the Bank, there is a uniform view that greater importance be given to farm-level transformations by some of the small and medium-sized producers Some expressed a sense of urgency by stressing the need for the formation of a "task force like response " Others stated that some targeted efforts need to be undertaken within a new strategic context All agreed that such strategies must be put within the framework of the important fiscal, policy, and institutional gains made during the structural adjustment period Equity concerns should not be the sole driving justification

There is concurrence that the INIA model is outdated and that new institutional arrangements have to be developed While new initiatives such as the IDB's first NTAE project in Jamaica, and new more producer-driven Ag REE programs are being proposed in Uruguay, Paraguay and other countries, there remains the related challenge of developing these programs within the new economic context which must incorporate national comparative advantages

The IDB has a new mechanism for financing experimental approaches Some units are using the IDB's new \$1 billion Multilateral Investment Fund (MIF) to finance programs This fund is designed to provide small levels of assistance to cover some costs for enterprises or NGOs to undertake major transformations to adapt to purely market driven economies Among other activities, MIF's small enterprise development component will focus on providing technical assistance and entrepreneurial extension services to these businesses (IDB, 1995b)

3 Potential Limitations on IDB Responses to LAC's Rapidly Emerging Needs

Strategic programming should incorporate broader comparative advantage planning themes All staff consulted commented that the new trade-driven development trend was important for hemispheric well being Given staffing limitations and competing priorities, professional assignments focus more toward project-level strategies As a result, there is an urgent need to assist client countries to visualize agricultural policies beyond strict national perspectives and place them within the context of broader sub-regional economic change

There should be broader institutional commitments to better support transformation There is the growing perception among staff that the IDB should better support the broad economic transformations under way However, given the complexities now emerging and the political sensitivities surrounding the role of agriculture in trade liberalization, the sense of importance and urgency was not equally shared throughout the bank or by senior management

E THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)

1 General Overview of the USAID Program

Ag REE institution building and capacity strengthening throughout the world have historically been major features of USAID and predecessor organizations. In many countries, U S assistance agencies initiated activities from which a series of relationships between LAC country organizations and U S institutions, particularly universities, have been at least informally maintained. U S institutions have made major leadership contributions throughout the world, especially during the Green Revolution. Recently, USAID's leadership in the donor community has initiated sustainable agriculture initiatives, policy reform, nontraditional agricultural export development activities (NTAEs) and related agribusiness programs. One recent draft review of USAID's programs concluded that it is "probably fair to say that no single component of U S foreign economic assistance was larger than the agriculture assistance program" (McClelland, 1995 v)

According to many professionals in the Ag REE area, USAID had the comparative advantage over other donor agencies. The on-the-ground cadre of technical expertise provided USAID's program managers with the capacity to introduce policy reform and institutional adjustments. According to one study, four factors unique to USAID contribute to such achievements: 1) access to the U S land-grant universities (accessing scientific and training capacities), 2) political and financial support, 3) organizational incentives, and 4) linkages with extension systems and farming communities (Oehmke, 1994: 46). From such experiences thousands of people were trained and, in many cases, a series of broader relationships evolved. Moreover, these experiences also provided opportunities for improving U S competitiveness through the introduction of new technologies, such as germ plasm and plant stock developments, which directly benefitted U S producers.

Recently however, major changes have taken place in USAID's agricultural programs. These changes are a result of both budget pressures and a changing focus and strategy in the Agency. Exhibit 18 in Annex A shows that a 50 percent budget reduction in support to agriculture has taken place over recent years. Greater cuts were observed in the USAID's traditionally strongest sub-sector, the REE component. LAC was the region most affected by these reductions -- budgets were cut in the region by 97 percent from 1986 to 1994 (USAID, 1995). Major staffing adjustments, particularly as they related to the mission and regional agriculture cadre, reductions in travel funds, and increased attention to documentation needs has further impeded program effectiveness. Currently the Agency's agricultural programs focus on four broad objectives: 1) prevent or mitigate food crisis, 2) increase food purchasing power, 3) intensify sustainable on-farm productivity, and 4) enhance rural market access.

Closely related to the TIAFTA study is LAC's new regional support activity, the Hemispheric Free Trade Expansion Project, which deals with trade liberalization, facilitation, market access, environment, and labor issues. At the mission level, there appears to be a variety of project initiatives within LAC whose titles at least demonstrate some Mission interest in supporting the trade liberalization process as shown in Exhibit 19 (Annex A).

Within the Global Bureau's Office of Agriculture and Food Security in the Center for Economic Growth is USAID's largest number of agriculture and related specialists. They manage projects (most of which have a research and development orientation) mandated to support field missions. An office strategy paper on agricultural research has been prepared which stresses the importance of providing developing countries with a strong research support program through USAID Missions in order to address increasingly complex problems (Farrington, 1995: 21-21).

The bulk of the Office's budget provides support to the CGIAR and the Collaborative Research Support Program (CRSP). The CRSP program is composed of nine research activities which respond to earlier identified global crises. These are university-led, multi-institutional, and multidisciplinary in nature. Budgetary trends for both programs are summarized in Exhibits 20 and 21 of Annex A. In addition, the office has a variety of non-university-led contracts which support mission needs.

2 Elements of USAID Program of Special Relevance to Emerging LAC Needs

Recent statements indicate that some institutional support for agricultural development and agricultural research may be forthcoming. A series of LDC and U.S.-based developments have converged which create the compelling case that helping transform LDC agriculture is the best means for expanding new markets for U.S. products. This creates a win/win opportunity for which USAID is suited to uniquely contribute. A series of senior-level public activities supportive of a "new beginning" for agriculture were observed as this report was being finalized.

Growing interests from donors and LDC leaders for the U.S. to provide leadership are commensurate with capacity and current opportunities. Current global challenges are daunting and U.S. installed capacities are still among the best to meet these challenges. USAID has access to some of the leading experts and experiences, and enjoys influence with LAC officials. Some projects in the Global Bureau are available for supporting various activities. There is interest that these assets be mobilized for mutual gains. This theme was articulated repeatedly and with great fervor during numerous interviews.

3 Potential Limitations for USAID to Respond to Emerging New Needs

Biases may be difficult to overcome. While recent senior officials speak to the importance of stronger agricultural programs, throughout USAID there is a lack of enthusiasm to support agricultural sector projects and even less regarding the Ag REE sub-sector. It may be difficult to reverse this pessimism. Positive and enthusiastic support will be required to encourage the limited number of technical staff to effectively strategize, design, and coordinate the innovative types of market-driven responses to emerging problems. Without such support, dislocation within the agricultural sector may jeopardize the broader objectives of trade liberalization.

Broad based strategic planning and institutional coordination is needed. As in the World Bank and the IDB, the implications of the current trade liberalization phenomena on agriculture will require a broader planning and information base to help design responses that can supersede national boundaries. New donor coordination and working arrangements will probably be required, along with a broad network of technical experts. Most importantly, the involvement of

private sector leaders in USAID programs should be more aggressively pursued. Such involvement is also called for by the "renewed" CGIAR and by the USAID Office of Agriculture and Food Security in their new agriculture research strategy document (See Farrington, 1995: 74)

F THE UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

1 General Overview of the USDA Program

Federal support (in real terms) for food and agriculture research has declined slightly in recent years as the farm population has continued to decline and the economy has shifted away from agricultural production. Compared with federal expenditures of \$1.5 billion in 1992 (of which \$952 million was for the USDA national programs with \$599 million going to State Agricultural Experimentation Stations (SAES)), the private sector spent \$3.7 billion on agricultural research. The SAES federal appropriation is, however, also supplemented by state resources which, in 1992, totaled almost \$2.37 billion, or 10 percent of the private sector system (ERS, 1995)

USDA R&D spending is three percent of the total U.S. R&D budget. When compared with expenditures as a percentage of GDP, the budget is smaller than the agricultural research budgets of Canada, Europe, Japan, and Australia (NCFAP, 1995: 7). Moreover, federal and state support levels have been declining since 1988. At the same time, there is growing public interest in health, food safety, and conservation technology development. Research directors must rigorously prioritize resources, solicit new sources of funding, and introduce greater controls. U.S. farmers realize that they must respond to a more competitive environment with reductions in long-standing support prices. They know that the latest technologies will be needed to stay internationally competitive over time and, as a result, some farm leaders are pressing the USDA to be more proactive in its support of global linkages which may directly benefit U.S. producers.

The USDA has traditionally deferred to USAID to manage the bulk of the U.S.'s international agriculture and research development activities, the current 1995 Farm Bill does not reverse this. There is growing concern from a variety of land grant university agricultural scientists, however, that the broader U.S. objectives would be better served if the lead responsibilities for international agriculture research and cooperation were managed by the USDA. There is little mention of agricultural themes to be undertaken by the Working Groups for the FTAA Initiative's Western Hemisphere Trade Ministerial.

Within the USDA, the one unit mandated to facilitate USDA's broader international involvement is the Foreign Agricultural Service's International Cooperation and Development (FAS/ICD). The program's mission is "to enhance the competitiveness of U.S. agriculture and preserve natural resource systems while pursuing sustainable economic development by mobilizing the resources of the USDA and its affiliates" (FAS/ICD, 1995: 1). During 1994, a series of scientific and data exchanges, orientation and study tours, workshops and fellowship training activities, collaborative research, and technical assistance activities were undertaken, mostly at USAID's request. Compared with other geographic regions, LAC was usually the region with the lowest involvement.

The Economic Research Service (ERS) and Animal Plant Health Inspection Service (APHIS) both play essential roles in trade liberalization work. The Trade Branch of the Commercial Agriculture Development Division recently initiated special studies and established a systematic data base related to trade flows in the Western Hemisphere. This information is essential to assist both U.S. and LAC countries and the donor community. APHIS has the key role for determining food crop, plant, and animal entrance to the U.S. APHIS representatives are currently positioned, or are programmed to begin working, in Mexico, Chile, Peru, Guatemala, and the Dominican Republic.

2 Elements of Special Relevance to LAC's Emerging Needs

USDA has a country-level presence Although few Agricultural attaches have acquired the broader strategic planning and development orientation associated with USAID's traditional agriculture development cadre, the USDA structure provides at least one knowledgeable U.S. official presence in some of the key LAC countries. As the USAID presence further erodes and if the appropriate orientation and support mechanisms are put in place, the USDA could possibly help facilitate TIAFTA-related information and coordination activities.

The ERS provides an invaluable resource for strategic planning purposes The trade data base and analytical capacity relating to hemispheric trade is clearly a valuable resource for FTAA initiatives.

3 Potential limitations for USDA to Respond to LAC's Needs

The USDA may have only limited involvement in the debate It is possible that as a result of the usually volatile deliberations historically associated with agricultural trade negotiations, policy makers have chosen not to focus on domestic or international agricultural trade issues. Given its growing importance, however, USDA and also USAID can provide the increasingly important role of raising sectoral issues as the discussion process evolves.

The APHIS Mandate May Constrain Optimal Response Although not well known, no commodity can be introduced into the U.S. market until lengthy research and registration processes are undertaken, this process normally takes five years to complete. This process could be accelerated while remaining respectful of the APHIS mandate. Indeed, if changes are not made, opportunities in the specialized niche markets will not be fully realized.

G U.S. LAND GRANT UNIVERSITY SYSTEM

I General Overview of International Programs

Many of the leaders in foreign national institutions, including private agribusinesses, the NARS and IARCs, received their professional training from land grant universities. U.S. universities played a major role in implementing Ag REE institutional development and strengthening USAID programs. Their involvement began in the 1950s and was particularly strong in the 1960s. Support for these programs began to wane somewhat during the early 1970s when the congressional mandate called for USAID to focus on the "poorest of the poor" rather than

develop institutions. In response, Title XII legislation in 1975 founded the Board for International Agricultural Development (BIFAD) and a structure which directly linked USAID's agricultural development program with the U.S. land grant program. USAID's program objectives, commitments, and activities decreased over the years and as a consequence, the training of LAC scientists has not kept pace with the latest techniques or sector diversification dynamics.

The most important ongoing activities involving the land grants are the Collaborative Research Support Programs (CRSPs). Presently there are 40 universities linked in varying ways with some 2,000 LDC and IARC researchers. All CRSPs have some relationship with LAC institutions. As funding levels eroded however, and the predictability of funding availability became increasingly uncertain, disenchantment within all segments of the program followed (Swindale, 1994).

These shifts in institutional commitments, program orientation, and funding levels are due to state and federal budget reductions and have caused great adjustments across the system with international agriculture program staff being reduced or curtailed. The National Research Council completed a report, Colleges of Agriculture at the Land Grant Universities: A Profile, which describes aspects of this changing world. No mention of international programs is provided except for the CRSP program (NRC, 1995: 40). Nonetheless the view of almost all of the parties consulted is that the land grant universities, although not as robust as before, remain an underutilized and valuable resource for collaboration with LAC Ag REE and related institutions.

In partial recognition of this capacity, the multi-university proposal "Global Research on the Environmental and Agricultural Nexus for the 21st Century" was presented. Formulated under a competitive grants program, this proposal describes a research fund which will link U.S. scientists with NARS and IARC collaborators in order to generate a "second Green Revolution." This proposal states that the major strengths of the university system is its: 1) vast size and associated internal economies of scale and scope, 2) research driven by demand of beneficiaries, 3) integration with upstream basic sciences, 4) demonstrated track record in downstream application, 5) continued importance in the development of human capital from developing countries, and 6) expertise in establishing the legal institutions and proprietary rights fundamental to development (GREAN, 1994: 2-6).

2 Elements of Special Relevance to LAC's Emerging Needs

Collaborative research is a cost effective means for generating new mutually beneficial technologies. The CRSPs provide one possible approach for addressing technological needs (Farrington, *et al*, 1995: 50-60). Their contributions have generated broad professional and political support. If such a model is used to address more market-based technology generation and diffusion systems, two recommendations from the Office of Agriculture and Food Security reviews should be considered: 1) the need to generate more directed economic impacts to include more interaction with end-users (Farrington, *et al*, 1995: 39), and 2) the need to integrate private sector representatives at all levels of operation (Swindale, 1995: 74). Research priorities would obviously have to be based on changing market demands. A different type of collaboration based on more direct U.S. producer support and IARC linkages (CIMMYT) is demonstrated by the wheat breeding project at Oregon State University.

Strong capacities exist for distilling information and for providing short courses and relevant degree programs With the introduction of computer technologies and the growing need to respond to local stakeholders with quick access to relevant information, many colleges have developed special "download" facilities to address commodity-specific, problem-related information needs, some of which will be relevant for LAC. These systems could be further distilled to address the concerns of specific target groups, including NGOs. In addition, non-degree and degree programs can be developed to address group or institutional needs.

Universities are adjusting their programs in response to new opportunities As part of this survey a questionnaire was sent to some of the major land grant universities regarding changing agriculture opportunities and how producers, agribusiness and academic curriculum would have to be adjusted. Responses indicated that some significant shifts are under way. Examples of two such shifts selected from the survey are provided in Exhibit 22 - Annex A.

3 Potential Limitations For Universities to Respond to LAC's Emerging Needs

Universities have limited involvement with agribusiness and producer groups regarding international collaboration There is a need to generate support and contributions from these institutional bases in order to create broader, more sustainable benefits throughout the hemisphere. Although there are some indications that a limited number of these university groups are increasingly interested in international cooperation, apprehension and/or vehement rejection of such activities were observed in others. Particular challenges relate to the membership of the producer associations and a common initial response was that "our scientists" cannot share "our technologies." If mutual benefits can be demonstrated, however, such opinions can be reversed over time.

Universities have concerns regarding USAID commitment in support of international agricultural research and development USAID budget reductions have caused major program cut backs in areas where long term relations, commitments, and research linkages had been established. Some concerns also relate to the reduction of USAID's field agriculture staff and differences in management styles.

H AGRIBUSINESS SECTOR

I A General Overview of the Agribusiness Sector

Agribusiness trends are changing dramatically both in the United States and in other countries. Traditionally, the bulk of U.S. agribusiness activities were domestic. As markets for U.S. agricultural products expanded dramatically during the 1980s and as agricultural enterprises became more science-based, interest in international agribusiness activities gradually expanded. Globally, economic growth and employment generation opportunities increased beyond the farmgate level, principally in areas of agricultural and related processing, marketing, and distribution.

USAID began taking a leadership role by introducing a series of agribusiness-related projects. This took place initially in LAC and then expanded to other regions. Efforts were made

to cultivate new "partnerships" between USAID and the agribusiness community. In 1991, a jointly-sponsored "Agribusiness Leaders Seminar" was convened which generated a series of recommendations for more productive future relationships. At this conference, the following summary of U S agribusiness mission statements was presented:

A customer-driven enterprise committed to providing optimum value in high quality products and services, thereby enhancing the wealth of the employees, the share holders and the communities served by the company. In fulfilling this mission, companies try to produce the best products on the market, deal honestly and fairly with their employees, sales representatives, business associates, customers, and stockholders, and give helpful management suggestions to their customers to assist them in making the greatest profit from their products (USAID, 1991: 3)

The U S agribusiness community has increasingly invested in research and product development. Since the 1980s, the private sector has surpassed the public sector in research expenditures. Research in the agricultural inputs industry grew the fastest, with the greatest attention devoted to chemical and biological innovations. Expenditures in plant breeding, farm machinery, and animal health were lowest. Research in the area of food and kindred products was less than one-half of that for total agricultural inputs (USDA/ERS, 1995: 4)

Agribusinesses are increasing technology development to respond to a broad range of conditions throughout the world. This has made intellectual property rights a vital aspect of corporate life. Returns are only realized if new technologies are commercialized and farmers benefit from them.

During the last few years executives have made every effort to be competitive and downsize, business strategies have often focused on the short term. These trends have made future business activities in uncertain new markets a somewhat lower priority. In spite of this, developments resulting from the Summit of the Americas have captured much interest. The Agricultural Research Institute (ARI), a non-profit organization which brings together members from industry, academia, and government, held their recent annual meeting on trade liberalization. For the first time, the USDA's senior Agricultural Policy Advisory Committee (APAC) discussed agribusiness issues with USTR officials to strategize about opportunities for U S agribusiness. During the Western Hemisphere Trade and Commerce Forum in Denver this July (1995), a special panel "Agribusiness in the Free Trade Area of the Americas" was convened. These panels were comprised of senior representatives from agribusiness, public, and international organizations and provided the various Working Groups of the Western Hemispheric Trade Ministerial with specific recommendations. The highest priority was that "governments should approach agricultural negotiations with a sense of urgency" (USDA, 1995b: 3)

2 General Observations Regarding Agribusiness and the TIAFTA Study

A market-based development strategy program is essential. The mobilization of a committed cadre of U S agribusiness, including producer and commodity groups, will be an important part of any sustainable hemispheric development program led by trade. Agribusinesses have established market systems, proven off-the-shelf technologies (particularly for the NTAEs), and market information services.

Agribusiness' attitude towards USAID needs mending Many of those who have worked overseas commented that working with USAID was frustrating, time consuming, and not conducive for agile, business operations

Many of the firms lack current information on business prospects within the Western Hemisphere trade area Firms tend to have general information, but lack specific information on the unique characteristics of each country's products, institutions, policies, regulatory controls, agro-ecological factors, access to markets, etc

Numerous benefits are possible through closer interaction and information support USAID and its various projects have access to a tremendous repository of information regarding agribusiness approaches and strategies. This information should be mobilized in conjunction with other USG efforts around the Western Hemisphere Free Trade Area

Agribusiness has limited international experience and strong trepidation toward working with small farmers While a sense of growing interest and awareness of opportunities was detected, agribusiness firms, including U S commodity groups, have generally not done much overseas work. In order to help generate appropriate interest from these important actors, further orientation as to business possibilities, "coaching" on operating in LAC countries, and reliable mechanisms to help them deal with relevant small-farm producers in the region are needed

There are increasing requirements for producers and importers to comply with U S quality assurance needs Certification requirements in areas such as CODEX alimentarius, HACCP, ISO 9000, ISO 14,000, organic certification, and sustainable forest products certification will be important considerations for expanding agriculture trade northward. Science-based technical standards and inspection systems, some of which have not yet been developed, will need to be in place and respected. These will have particular impact for small to medium-sized producers

I PRIVATE VOLUNTARY GROUPS (PVO) AND SUPPORT GROUPS

1) A General Overview of PVOs and Support Groups

There is an emerging consensus that some small to medium-sized farmers will not be able to compete with better endowed producers unless they have access to current technical information appropriate varieties, market information, working capital, production credit, etc. These matters have not been a constraint to many of the entrepreneurs who have recently invested in agriculture. Some new organizational structures need to be considered for those poorly endowed, given the inherent economies of scale associated with providing such services in a cost effective way. One recent study of NTAE developments in LAC concluded that effective local organizations are probably the only means by which small farmers can participate in NTAE activities (Thrupp 1995: 74)

There are many institutional models and purveyors of such support positioned to assist small- and medium-sized farmers. Many U S PVOs have this capacity. For example, the largest grouping of U S -based PVOs, InterAction, lists 81 organizations with experiences in the area of

enterprise development, cooperatives, and credit loans. There is an increasing number of LDC-based NGOs, many of which have been supported by U.S. affiliates, who are becoming engaged in promoting U.S. assistance through USAID's Advisory Committee for Voluntary Foreign Aid and the "New Partnerships Initiative."

Under USAID's sponsorship, the LAC region has a long tradition with a variety of community-based organizations. Despite some successes, there are a considerable number of failed experiences, particularly in the agriculture sector. There also are not many success stories for cooperative support activities in the now emerging market-driven environment, although some successes do stand out. In Guatemala, the Cuatro Pinos Cooperative built around neophyte snow pea producers under USAID support is one of the best examples of a successful enterprise (Thrupp, 1995: 73). The Inter-American Foundation support to the Chiapas, Mexico-based quality coffee operation, La Selva, is also a very well respected enterprise (Contreras Murphy, 1995) as is the Grenada Cooperative Nutmeg Association (Henry, 1988). USAID's Central American PROEXAG Project was a successful model which worked through organized producers and national trading associations to link producers or middle man buyers with U.S.-based firms.

Many of the U.S.- and local organizations are particularly strong in social development of subsistence-based systems and are very good at facilitating local involvement and support. In many instances, however, they lack the management acumen and technical knowhow required for high risk and highly competitive enterprises. One recent review concluded that while NGOs have much to contribute, they must improve their technical capacity and diversify without adversely affecting their positive characteristics, such as the concern for farmer participation and well being (Kaimowitz, 1993). The GREAN initiative concluded that both local and international NGOs "often fail to sufficiently appreciate the importance of productivity increases and income growth in alleviation of massive poverty in developing countries" (GREAN, 1994: 2-18).

2 General Observations Regarding Local Support Activities and TIAFTA

Some institutional support is needed to facilitate transformation processes. There are a small number of experiences which have successfully helped link the changing needs of the marketplace with producers so that maximum local income and employment benefits can occur. When combined with the not-so-successful examples, some of these experiences offer an opportunity to develop a list of important lessons learned.

Public awareness and other support services may be needed. For the most productive transitions to occur, the new environment requires that policy, regulatory, institutional support bases and positive public attitudes be firmly in place. Even with these elements in place, there will be consternation and hostility as vested local interests and commodity-specific producer groups may choose to oppose the tough adjustments to come. To aid in guiding this process, respected national non-profit groups may have to be strengthened to help educate policy makers and leaders and to help ensure that the most appropriate producer and consumer concerns related to new economic trends are developed and fostered.

Technical and business skill levels need improvement One of the main causes for business failure in NTAE enterprises appears to be the lack of know-how in the production, marketing, or managerial areas along product lines. Special basic programs around product-specific know-how and business management will be priority activities. Particular production-level concerns related to plant phytosanitation, pesticide application, integrated pest management systems, and soil and water conservation and management are important additional topics.

J CONCLUSIONS

1 There is a Brewing Crisis in Latin American Agriculture

There is broad agreement among the donors and various institutions contacted for this report that the agricultural sector in Latin America currently faces grave challenges which will increase as the FTAA is implemented. Without formulating, at a minimum, more appropriate technology generation and diffusion systems, rural areas will not improve, this in turn, will provoke disruption and unrest which could jeopardize progress toward free trade and cause environmental degradation. The need for technology diffusion systems was found to be particularly acute, however, because these challenges are so recent, actors within the donor community have not adequately conceptualized the problems, determined where potential opportunities may lie, or developed specific approaches to address the issues.

2 Donor Initiative and Cooperation is Critical

Concern regarding the "malaise" of the agriculture sector in the region is concentrated at the working levels of the donor institutions we consulted, this same concern was not universally felt at the more senior levels, and some donors have few staff members strategically working on the changing role of agriculture within the trade liberalization context now occurring throughout the LAC region. Moreover, the importance of agriculture to the overall success of the FTAA activity is not conveyed in the various Ministerial Commissions nor in the agenda of the U S working groups. This may be a result of the difficult and sensitive issues traditionally associated with agricultural trade negotiations. It is vital that the disparate new starts being made in the Ag REE sub-sector by virtually all of the donor institutions be coordinated within a broader, mutually supportive and reinforcing strategy. Some of the basic elements are in place which, if better coordinated, possess the capacity to begin generating significant contributions. The importance of this coordination cannot be overestimated considering both the magnitude of the challenges ahead and the necessity of maximizing the impact of scarce resources.

3 The United States is Positioned for Leadership

There is a need for strong leadership to help provide guidance, leadership and support among a broad range of U S institutions. Representatives from all the institutional bases consulted expressed a desire for technical leadership similar to that previously provided by USAID in agriculture. USAID could provide invaluable assistance with strategic planning and program design as part of a broader support group. This would help to introduce the most appropriate programs and provide access to U S -based resources. U S expertise was widely regarded as particularly important for LAC countries to respond to mutually beneficial trade

possibilities within the Hemisphere. Such support would directly increase the chances of rapid market expansion, and would help assure system sustainability.

4 Market-Directed Development Strategies Must Be Followed

Market-directed development strategies must guide donor activities. Many institutions have had difficulties in developing market-related strategies and action plans. While this is partly because the market-oriented focus is new, it is also a result of the traditional working relationships which use the public sector as the principal focal point for program activities. New roles for the public sector must also be developed to facilitate appropriate relationships.

5 Basic Criteria for a Possible Future Technology Generation and Diffusion System

Based on this overview, there is no broad institutional base possessing the basic qualifications needed to respond to the challenges of an era of expanding trade. The evolution of a sustainable Western Hemisphere technology development system must follow a series of guiding principles. Drawing from the institutions and experiences examined in this review and their application to broader strategic recommendations, we developed the following as suggested criteria for this system:

- The Ability to plan strategically is necessary to consider changing market needs at national, regional, and sub-regional levels within the context of risk reduction, employment generation, and changing market needs over time. An enhanced capacity to conceptualize and prioritize the necessary minimal support interventions and develop appropriate plans of action will be essential.
- Analytical tools and action plans driven by market-based working precepts are needed so that decisions are made based on access to basic market information, including quality and quantity concerns, likely competitors, etc.
- Access to the most appropriate technologies and technical assistance in the areas of production, post-harvest handling, processing, and managerial technologies for enterprises dealing with priority NTAEs, cereal, or mixed farming operations is essential.
- To convey a sense of institutional commitment to directly provide or facilitate financial support to new market-based Ag REE systems and to access the best technical resources on a timely and systematic basis. Interest for the long term, beyond the usual four year project lifespan, will be critical. Such support is essential to convince key LAC and U.S.-based national stakeholders, producers, enterprises, governments, possible support institutions, and donors that profound changes will be followed through. The ability to generate a political support base at all levels of operation is critical.

- To the maximum degree possible, undertake particular support activities from the perspective of mutual benefits. While this conviction should prevail in all activities, the North/South linkages within the context of trading partnerships provides special opportunities to link technology needs with current and future business opportunities. No one institutional base demonstrated the capacity to do the job independently.
- Agile and flexible operations capable of quickly responding to changing climatic conditions, market prices, custom delays, plant viruses, etc. must be an essential component of program management. Program management must be based on reliable information and sound business principles, not bureaucratic processes.
- A highly collaborative spirit across key institutions will probably be an essential behavioral trait. During this phase of TIAFTA, such a willingness was observed in most of the institutions contacted.

It will be difficult to mobilize and sustain programs based on these high, new standards. The market dynamics which make them both feasible and necessary are only just emerging and, as a result, no ideal model or approach was observed during this review. The one activity which best embodies these precepts is evolving between Washington State and Chilean institutions. Centered at Washington State University, this cooperative arrangement is reviewed and discussed in Section IV.

SECTION IV

ONE APPROACH TO FACILITATE TECHNOLOGY CHANGE

Section III provided a descriptive assessment of the programs of key institutional bases dealing with the challenge of technology development and diffusion during an era of trade-led economic development. A greater sense of program focus, urgency, and commitment will be needed in order to help prepare for the anticipated sweeping changes in both the South and the North. Few examples of the major institutional adjustments needed now exist. However, to help better understand some of the dynamics, approaches, and capacities necessary under a possible new approach, a description of one of the most useful examples referred to (The Washington State/Government of Chile Partnership) will be explained. One of the most important facilitators of this partnership is Washington State University's (WSU) International Programs Office. A description of this broad activity is provided below.

A EVOLUTION OF THE WSU INTERNATIONAL VISION

The globalization process now under way at WSU is the product of several developments. The state's economy revolves around expanding exports globally so business leaders increasingly insist that future employees have a better grasp of how to work beyond our borders. There is an awareness that information and technology needs require global access and that to be on the cutting edge in a discipline, professors must maintain meaningful international contacts. These contacts, moreover, are thought to be one way to compensate for budget reductions at the state and federal levels which have cut into research budgets, particularly in agriculture.

While these are relatively recent developments, WSU would not have been able to conceive of the new vision without its long association with international development. Founded in 1954, the University's overseas business had increased considerably by 1979 and for a number of years, WSU had the largest volume of USAID business of any university. This business, along with program support grants, has given over 60 percent of the faculty a mutually shaped experience base. The working precept emerged that to be competitive and make the universities stakeholders more competitive, WSU had to go overseas. To do this, the institution had to both have access to top minds and involve itself in meaningful activities of mutual benefit. These were the guideposts for WSU's new global initiative.

B THE GLOBAL LAND GRANT UNIVERSITY (CLGU)

WSU's Global Land Grant University (GLGU) program grew out of the University's international experiences. The program is based on development of mutually beneficial products which result from sharing information, technology, and resources via global partnerships. Only those activities of direct mutual benefit to WSU, Washington State, and collaborating countries are considered. Resources are marshaled from a small WSU fund, foundations, and business contributions to fund a series of "strategic alliances." Some 45 LDC/WSU activities involving WSU with collaborating U.S. institutions, universities in host countries, and private sector organizations are evolving. Eight different activities are in various phases of development in LAC (WSU, 1995). While the program is interdisciplinary, the close ties between the Colleges of Business and Economics and those of Agriculture and Home Economics are of particular interest. The program also has the committed support of the University President.

C WSU AND UNIVERSIDAD DE CHILE (UC) COLLABORATION

Over the last three years, mutually beneficial programs with the prestigious Universidad de Chile (UC) have evolved in integrated pest management, food sciences, agriculture, pharmacy education, natural resources, humanities and social science, nutrition, and international trade. Workshops were initially held with the teams of each program which then developed a series of specific joint research activities. In many instances the respective faculty have generated foundation money to support their projects. A few joint short courses in both countries have been held, some of which were financed by IICA. Communication over the Internet keeps each university network quickly apprised of activities. The director of UC's Washington D C -based liaison office, which has similar ties with 10 other U S institutions, termed this agreement "their best, and should be the model for any international program "

Chile is also Washington State's partner in the national Partners of the Americas Program. This program promotes academic, cultural, and trade promotion activities through the use of seminars and other events. WSU is very closely linked with the Chapter's activities which, in turn, is supportive of WSU's work.

D COLLABORATIVE MUTUALLY BENEFICIAL RESEARCH

Under this umbrella agreement, a variety of productive collaborative activities have been started. In order to provide an idea of how new institutional alliances function, summaries of those dealing with raspberries, strawberries, apples, and crop modeling follow.

Raspberries - Washington raspberries have traditionally been regarded as the premier line (number one producer in the United States), but over recent years the Chileans have been producing better quality at much higher yields. The Washington producers chose not to react to Chile's progress and provided only a small amount to WSU (\$30,000 per year) for research. The WSU small fruits specialist, who has considerable ties in Chile, responded to a request from the Chileans to pay for his services to address soil compaction problems due to the introduction of mechanized pickers. Washington producers initially resented such efforts, but over time, they received impressive benefits. The WSU scientist was able to provide his "clients" (the Washington producers) with off-season results from the yield trials the Chileans were financing. He shared with them the more progressive practices employed in Chile and introduced the new Washington-produced vibrating pickers to the Chileans generating considerable sales. Some Washington producers actually accompanied him to Chile and saw what the Chileans were accomplishing. Instead of resting on their "laurels," they decided to increase their research contributions to WSU.

Strawberries - There are only two parent lines of strawberries in the Northern Hemisphere. In Chile, there is a parent which has not been well studied. The same WSU researcher mentioned above traveled on a USDA biodiversity collection tour and obtained large disease free materials of superb quality of this parent. Based on the established protocols, he left them in Chile for further testing and development with the suspicion that the plant material would probably not survive testing and laboratory analysis. Upon a subsequent trip, his suspicion was confirmed and he was provided with new plant stock. Again, under the established protocols, he

proceeded to develop a sufficient number of plants in Vancouver, Washington and returned to provide the "Chileno variety" to the government. Millions of dollars will be generated in Washington and Chile as a direct result of this expedition which cost roughly \$30,000. As a result, the Washington growers commission is increasing its funding for the WSU research budget.

Apples - Apples are the number one crop in Washington. Only two public sector temperate fruit-tree breeders work full time in the United States, one of which is at WSU. In comparison, New Zealand has 14 and Japan has 7. Based on joint programs, entomologists and pathologists from Chile and WSU are developing some virus-free fruit stock and, by taking advantage of the counter cyclical growing period, are providing scientific data more quickly. Close linkages with the Washington Apple Commission have developed through these ties and marketing opportunities benefiting the apple industries in both countries have evolved. Students from both the United States and Chile are considering a cooperative internship program with the view that it is best to know your competition first-hand.

Crop Modeling - The Biological Systems Engineering Department at WSU has considerably expanded its activities in the LAC region through extensive faculty exchanges. Graduate students from LAC countries are focusing on value-added technologies and environmental enhancement interventions. A large number of crop modeling activities sponsored by this department are under way in Chile to assess crop responses under varying soil, climatic and management systems. They are also testing controlled atmosphere equipment which may lead to the purchase of Washington-produced storage equipment.

E MARKET-DRIVEN RESEARCH

While the WSU/UC Agreement institutionalizes the evolving relationships, an important principle guiding much of the work is the "product" of the International Marketing Program for Agricultural Commodities and Trade (IMPACT). State funds support this center which helps agricultural exports by collecting information, including laws and consumption trends, and helps guide research to develop new products which can gain a particular competitive edge in niche markets. For example, the center has performed consumer surveys in countries where market opportunities were observed. From this research, specific guidelines have been created to develop the particular commodity. Pinpointing the properties of the great variety of noodles in Asia provides another example. Based on local taste, texture, gluten levels, and other characteristics, noodles are classified and become the basis for the production of new wheat varieties in Washington. Both this program and the State Trade Development Office are highly praised throughout the state.

F CONCLUSIONS

WSU has switched from a traditional international program approach built around language training, interesting trips, and taking most contracts that come down the pike, to one focused more on developing strategic international linkages which also engage the local business community and are based on mutual self interests. This is an approach which generates multiple payoffs.

There are elements of this program which have great relevance to the approaching institutional transformation process which will rapidly take place throughout the Western Hemisphere. At a minimum, the WSU experience should be more widely shared with the broader academic and business community, including producer associations and state trade offices. It appears that broader support probably will have to be mobilized to address the more specific problems of the TIAFTA target audience, for example, the relevance of this case to small and medium-sized producers in Chile will have to be expounded.

Some additional concluding points are provided.

1 Skeptics become supporters of international collaboration Over time, growers change their attitudes from one of "Hey, what are our scientist doing giving away our varieties," to the view that in the modern world everyone has access to information and if they disperse their representative widely under an agenda of mutual benefits, they improve their overall competitiveness. As one leader said, "these days its better to know your enemy well."

2 Acceptance of "globalization" will occur over time All consulted professors acknowledged that the more global vision improved their program and also had a positive impact on the state over time. Overseas exposure and appropriate use of funds facilitated the development of this approach. The change in mindset from a somewhat pejorative "international assistance" view to one of "development cooperation" is an important distinction and took time to be institutionalized. The challenge is not yet over.

3 Reactions toward USAID involvement were mixed All persons interviewed were extremely interested in the TIAFTA Study and freely gave us their time. They were also very appreciative toward USAID in their discussions and noted that it was the Agency which made many of these contributions possible. Some frustrations were, however, also expressed. Their two principal concerns were 1) why such a mutually beneficial program as support to international agriculture had become such a small part of the USAID program, and 2) that USAID's current concern with the 'process' would combine with the limited money in agriculture assistance to make their work doubly difficult.

CONCLUSION

A new era of economic opportunities based on trade liberalization has begun. As the principles of competitive advantage would dictate, free trade is causing significant shifts in the agricultural sectors of many LAC countries. Described in Section I, this transformation generally reflects a response to increasing export opportunities for producers who are shifting to higher-valued crops through the use of market-oriented production, post-harvest handling, agroprocessing, and marketing systems. The new opportunities presented to the LAC region generally entail higher capital costs and greater risks. These opportunities cannot be exploited if the producers do not have ready access to appropriate technologies, information, and related management and marketing skills.

The main benefactors of these trends -- apart from consumers -- have not yet been clearly determined, but the process of transformation is likely to cause significant disruption in the agricultural sector and the region as a whole. Peter Drucker reports that the transfer of the labor force from farming to the industrial sector occurred relatively smoothly over the past 100 to 150 years in the developed free-market economies. He fears that such a transformation will be more difficult for the developing nations of today in part because, "knowledge, not labor or raw materials or capital, is the key resource for the future" (Drucker, 1994: 58).

In Latin America, the institutions which produce and disseminate knowledge critical for the region's agricultural competitiveness are in disrepair. Section II concluded that the National Agricultural Research Systems (NARS) and National Agricultural Research Institutes (INIAs) models were designed to address the self-sufficiency concerns of the import substitution era. As a result, they are inappropriately structured to exploit national competitive advantages. The section further concluded that even in the more dynamic agricultural economies, the present systems are not generating sufficient new flows of knowledge to allow small and medium farmers to respond to the more diversified opportunities. Nor are the systems helping prepare such producers for the negative impacts free trade will have on traditional cereal crops. While a series of reengineering approaches are under way, and must be carefully observed, they are generally not "market based" in their orientation. Instead, they are still heavily NARS-based, lack the broader internal and external linkages to provide current knowledge in the rapidly growing NTAE sub-sector, and have limited links with the private sector.

Section III provided a descriptive assessment of the various sponsors of technology services relevant to market-based technology development and transfer systems. The possible contributions that each institution could make to these systems was assessed. Given the complexities of the dynamics and the recent nature of the challenge (particularly with low levels of institutional support by the donors and the LAC governments), it is not appropriate for this study to present specific recommendations regarding the shape of a new mechanism which could develop and transfer agricultural technology. Instead, a series of selection criteria were developed that we felt should be used to determine the responsiveness of programs to the new challenges. Employing these, we concluded that while some relevant activities are under way which utilize strategic alliances (such as the example described in Section IV between Washington State University and the University of Chile), no one institutional base or model was observed which could meaningfully confront the challenges posed by the shift to free and open markets. Based on 1) the magnitude of the task, 2) the rapidly approaching target date for the FTAA (2005) and consequently limited time to conduct extensive experimentation, 3) the dispersed nature of the

talents and resources observed, and 4) the need to place this effort strategically within a broad, programmatic and operational framework, efforts should now be directed to develop suitable strategic approaches

Free trade has triggered the responses in the agricultural sector that trade economists envisioned. If the principles of comparative advantage are applied to institutional development, more appropriate institutional approaches should be quickly generated. New approaches for providing appropriate knowledge for a broader segment of the population will have to be based on responsiveness to market forces. At this juncture, much more has to be learned before an appropriate new structure to develop and disseminate this information can be proposed.

While developing the appropriate strategic response to help ensure sustainable agricultural development in the Western Hemisphere, additional work needs to be done in areas concerning 1) the farm-level dynamics and projected commodity sub-sector movements in countries where the transformation process is most developed, 2) country-level farm and institutional dynamics, 3) new approaches to technology diffusion (the least addressed topic by the support units reviewed), 4) U.S. agribusiness interests and capacities, 5) appropriate university roles, and 6) possible NGO roles. From such work more appropriate institutional approaches should emerge. Better guidance regarding future NARS roles, approaches based upon economies of scale, institutional comparative advantages, and changing budgetary realities should also quickly develop.

The Free Trade Area of the Americas provides an important opportunity for greater U.S. leadership which should generate significant benefits to all participating countries. The common concern observed throughout all our interviews was the urgent need for U.S. leadership in the agricultural sector. At the same time, all parties were aware of the particularly difficult challenges USAID is confronting.

If USAID determines that a strategy formulation phase is the next step needed to reach the goals of the FTAA, the following recommendations should be considered as the free trade process evolves:

- Bold new institutional paradigms are needed based on the primacy of "institutional comparative advantage." This precept would provide the basis for the establishment of dynamic institutional linkages, operational processes, and working relationships with a broad spectrum of technology-related institutions beyond USAID. Within the new paradigm, the driving concepts should be "market-driven," "sustainable relationships," "mutual benefit," "operational agility," "responsiveness to local resource constraints," and "responsiveness to market demands."
- The differences in national comparative advantages will lead to customized institutions for each country in the region. There is, however, important information regarding new approaches which should be shared across borders. To address this task, the variety of support bases needs to be better coordinated.

- New “mindsets” must be created at all institutional levels. For example, economic ministers need to think of the agricultural sector as an engine of sustainable development, U S producers must be brought to realize that potential new technologies may be mutually beneficial, producers must become more confident about higher-risk production options (for which the provision of appropriate information will be essential), and finally, researchers should emphasize market needs and the reduction of unit costs of production over production-maximization priorities of the past
- Given a consensus on the need to move quickly on the development of new strategies and approaches, what is now required is a broader construct that will support "harnessing" the essential institutions. Respondents indicated a strong sense of urgency to rally around a "task force-like cause of high purpose "
- The concept of strategic alliances is one that needs to be more thoroughly explored. Programs which encourage mutual benefits to accrue and/or foster formal or informal linkages between the real beneficiaries of the newly developed technologies may be the most promising type of structures

Additional Research

In order to help mobilize support at all levels for this new initiative, including LAC leaders (many of whom do not yet perceive agriculture as the "engine for national development"), development professionals (who may not currently recognize the potentially dynamic role agriculture can play in an open economy), and members of the U S agricultural community (many of whom are skeptical of cooperative arrangements), a series of more targeted studies is recommended. These studies should more deeply explore the following areas and could provide the basis for a comprehensive strategy document for the development of a FTAA Agricultural Technology System

- Country-level, sub-sector, and/or commodity projections and also recent and anticipated inter-regional, country-level, and commodity trade activities,
- Responses of small to medium agricultural producers within selected countries, such as Chile, Costa Rica, Mexico, and Peru, which may be reactions to the emerging hemispheric free trade movement (special focus would be given to NTAE and cereal producers),
- Major technological and information gaps that will need to be overcome in order for small to medium producers to be competitive,
- Employment generation potential observed in countries going through change (e.g. Chile, Costa Rica, Mexico, and Peru),
- Country-level institutional changes and current dynamics in support of market-driven technological change,
- Capacities and appropriateness of the institutions described in this document to guide new agricultural strategies

Proposed Future Actions

The TIAFTA TEAM is well aware that while the above recommendations are of considerable importance, this study addresses a complex subject during a period of uncertainty on many fronts. While some element of a future FTAA Agricultural Technology System may be funded from a variety of donors and other sources, sustained and broad-based institutional commitment within USAID and in the wider donor community may be difficult to mobilize. A new organizational concept will be required that is geared to generate broad support. Various institutions will need time to “buy in” both intellectually and financially to fund such an arrangement. New operational approaches and institutional relationships will have to be developed and nurtured. The new models will require extensive strategic planning, educational support, program coordination, donor coordination, U S institutional linkages, and overseas monitoring and reporting. The following activities will serve to start this process.

- Forward executive summary and final report to key personnel consulted during the study
- Prepare a LAC TECH Technical Bulletin and disseminate broadly
- Conduct targeted briefings for USAID personnel
- Organize USAID-chaired meetings with other donors, U S government agencies, and appropriate institutions to share findings and implications
- Conduct a series of reviews or surveys with the various institutional bases contacted, paying particular attention to share the TIAFTA study conclusions and recommendations with agribusiness and commodity groups and to solicit their observations and recommendations
- Disseminate the Washington State and Chile study (Section IV) and conduct a workshop with Washington State representatives as well as university, commodity, and state trade representatives
- As additional information is obtained, share with the emerging network

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ANNEX A - Exhibits

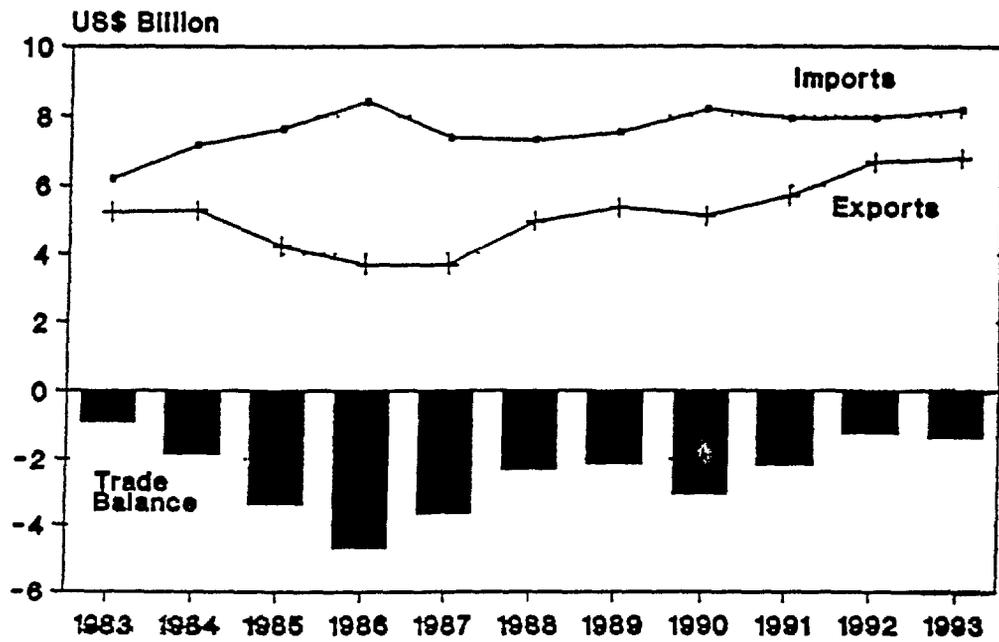
EXHIBIT 1

Western Hemisphere Agricultural Exports, 1981-83 and 1991-93 ^{ab}										
Regional Trade Group and Selected Countries	1981-83					1991-93				
	Agricultural Exports					Agricultural Exports				
	Total Agr'l Exports (mill \$)	To WH ^c		Within RTA ^d		Total Agr'l Exports (mill \$)	To WH		Within RTA	
		Value (mill \$)	%	Value (mill \$)	%		Value (mill \$)	%	Value (mill \$)	%
NAFTA	47,329	10,479	22.1	6,472	13.7	54,671	19,338	35.4	15,798	28.9
U S	37,709	7,018	18.6	3,745	9.9	41,623	11,346	27.3	8,587	20.6
Canada	7,996	2,221	27.8	1,521	19.0	9,843	5,152	52.3	4,446	45.2
Mexico	1,624	1,240	76.4	1,206	74.3	3,205	2,840	88.6	2,765	86.3
MERCOSUR	16,769	4,003	23.9	827	4.9	18,074	5,317	29.4	1,878	10.4
Brazil	9,427	2,370	25.1	153	1.6	9,124	2,128	23.3	372	4.1
Argentina	6,096	1,187	19.5	333	5.5	7,338	2,490	33.9	1,036	14.1
Andean Group	3,377	1,497	44.3	127	3.8	5,022	2,359	47.0	424	8.4
Colombia	2,203	799	36.3	75	3.4	2,672	1,250	46.8	198	7.4
CACM	3,009	1,556	51.7	173	5.7	3,694	2,074	56.1	164	4.4
G 3	3,916	2,058	52.6	72	1.8	6,118	4,284	70.0	216	3.5
Caribbean	1,707	772	45.2	72	4.2	1,838	598	32.5	70	3.8
Chile	707	268	37.9	-	-	2,192	1,090	49.7	-	-
Western Hemisphere	73,460	18,844	25.6	-	-	86,179	30,960	35.9	-	-

Source ERS/USDA Western Hemisphere Trade data base, Valdes, et al
^aTable depicts 1981-83 and 1991-93 annual averages
^bAll dollar figures are in millions of US 1992 dollars
^cWH = Western Hemisphere
^dRTA = Regional Trade Area

EXHIBIT 2

U.S. Agricultural Trade with LAC 1983-1993

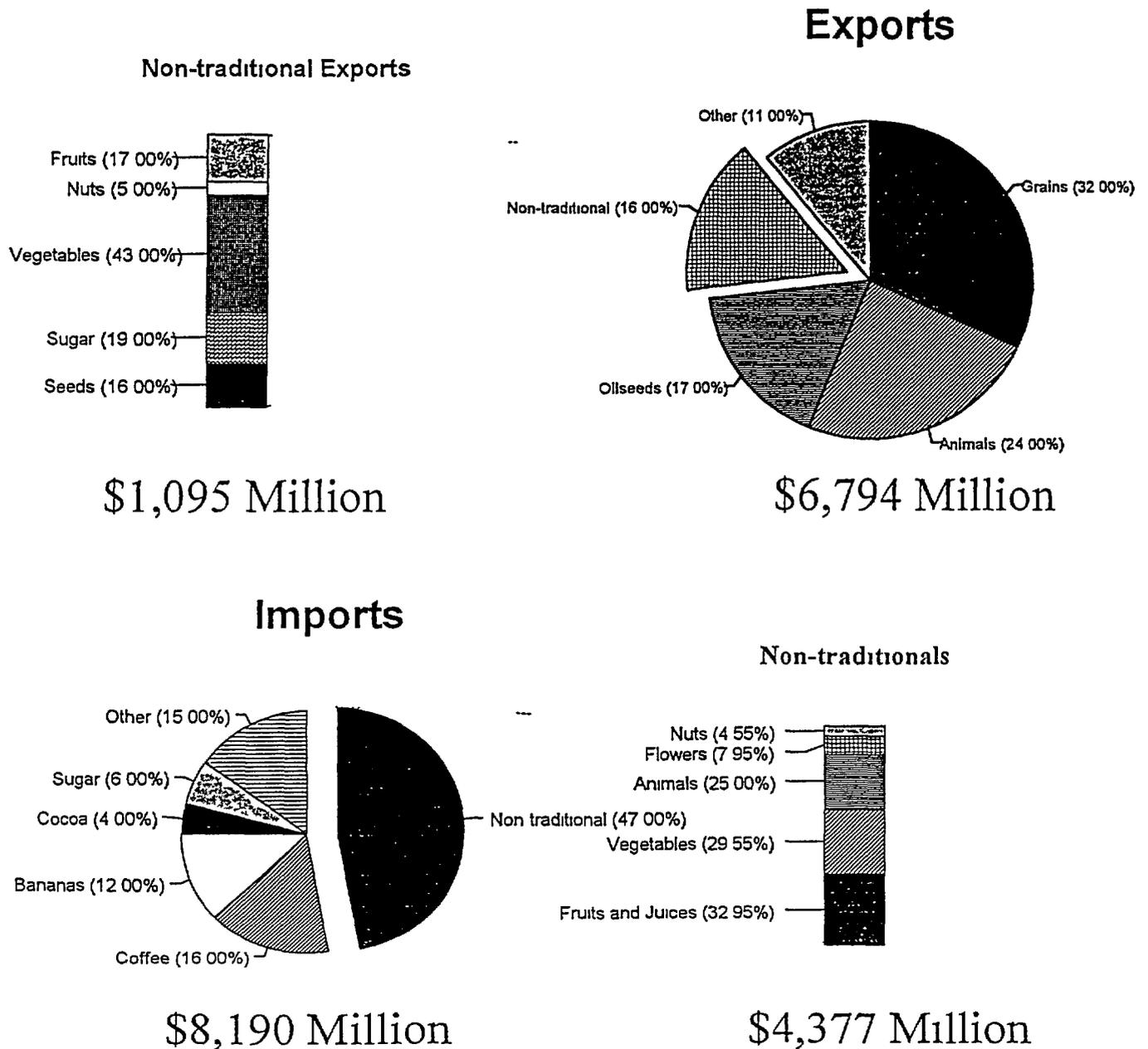


SOURCE FATUS, U.S.D.A

16

EXHIBIT 3

Composition of U.S. Trade with LAC, 1993

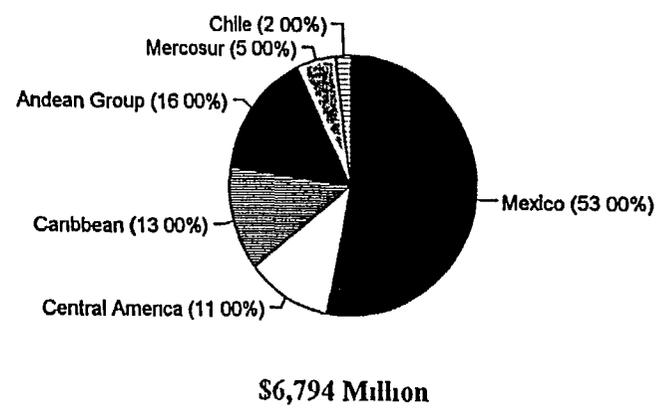


Source FATUS, 1993 USDA

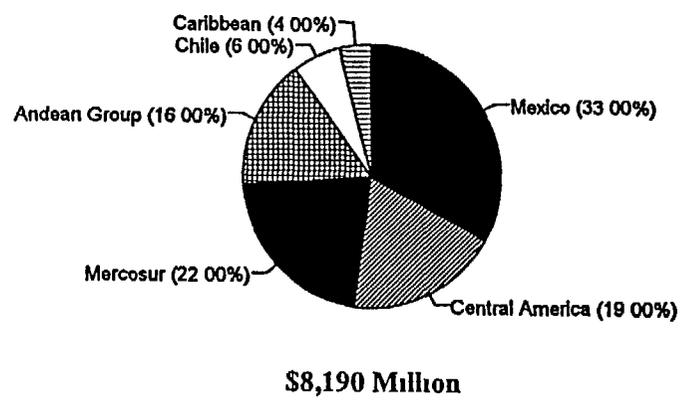
EXHIBIT 4

Direction of U.S. Agricultural Trade with LAC, 1993

Exports



Imports



A-4

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EXHIBIT 5

Average Tariffs for Selected Latin American Countries				
Country and Pre-reform Year	Average Tariff Rates ^a		Average Tariffs ^b for Agricultural & Food Products, 1994	
	Pre-reform	1994	Agriculture	Food
Argentina (1987)	42 ^c	15 8	11	16
Bolivia (1985)	35	9 8	10	10
Brazil (1987)	51	10 7	7	11
Chile (1984)	35	11 0	11	11
Colombia (1984)	61	11 6	12	17
Costa Rica (1985)	53 ^c	11 7	13	16
Ecuador (1989)	53	11 9	12	18
Guatemala (1985)	50 ^c	10 8	13	16
Honduras (1985)	41 ^c	17 9	20	25
Mexico (1985)	22 6	11 6	12	15
Peru (1990)	66	16 3	17	18
Uruguay (1987)	32	14 7	14	13
Venezuela (1989)	37	11 8	12	18

Source: Alain and Raja Patirana, Lustig and Primo Brava OAS
 Unweighted
^bRounded
 Includes tariff surcharges

EXHIBIT 6

Per Capita Food Production in USAID-Assisted LAC Countries
(Source IBRD World Development Report, 1989).

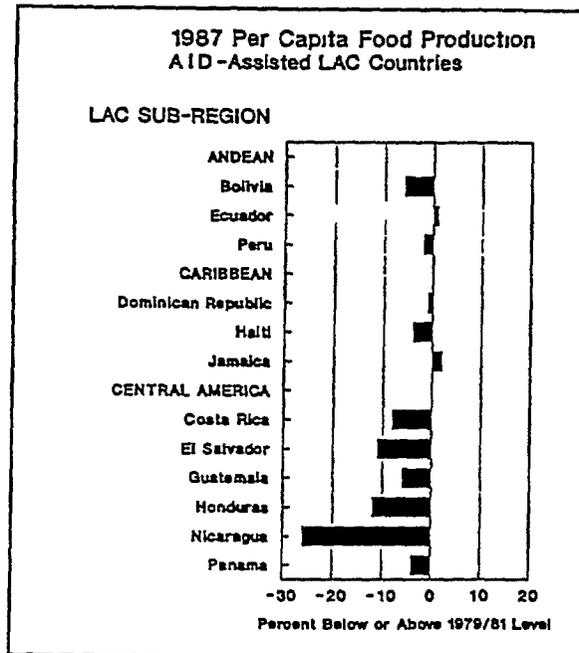


EXHIBIT 7

Growth in Cereal Imports to USAID-Assisted LAC Countries
(Source IBRD World Development Report, 1989)

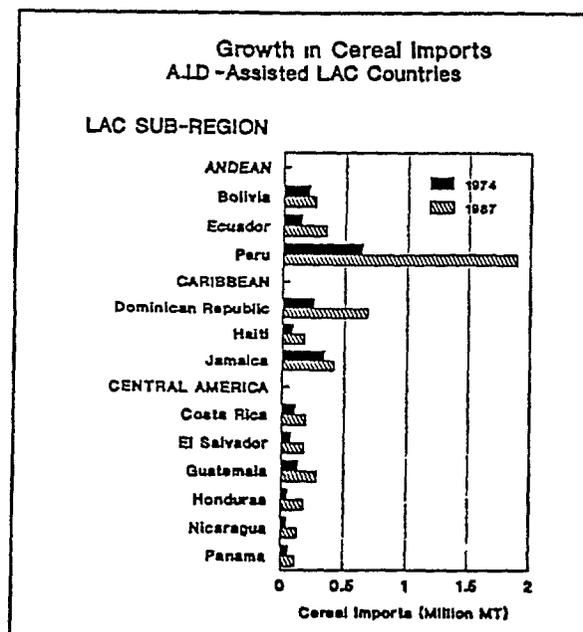


EXHIBIT 8

Indicators of Agricultural Productivity in the LAC Region Compared with Other Regions of the World (CIMMYT, 1993, 1994).					
Region	Average yields of all Cereals 1990-92 (t/ha)	Growth Rate of Yields of all Cereals 1951-92 (%/yr)	Growth Rate of Wheat Yield 1983-92 (%/yr)	Growth Rate of Corn Yield 1983-92 (%/yr)	Growth Rate of Per Capita Cereal Production 1983-92 (%/yr)
Mexico, Central America, and the Caribbean	2.3	2.8	-0.4	1.3	-2.0
Andean Region, South America	2.2	1.9	1.4	0.6	0.6
Southern Cone, South America	2.2	1.5	1.5	1.4	-2.0
Western Europe, North America, and Other Industrialized Countries	4.1	2.2	1.5	2.7	0.3
Eastern Europe and former USSR	2.2	2.2	2.3	-2.3	-1.0
East Asia	4.4	3.2	1.3	2.4	0.4
Southeast Asia and Pacific	2.8	2.1	--	2.3	0.4
South Asia	2.0	2.2	2.6	2.1	0.0
West Asia	1.7	1.6	2.7	4.0	0.2
North Africa	2.0	1.9	5.5	3.8	3.4
Western and Central Africa	0.9	0.9	-4.7	1.5	1.0
Eastern and Southern Africa	1.1	0.9	3.7	2.0	-0.6
World	2.8	2.2	1.9	1.8	-0.4

EXHIBIT 9

LAC Bureau ARDN Portfolio Summary^a by Strategic Funding Categories (FY88-FY91) \$'000 by Subregion

STRATEGIC CATEGORY	ANDEAN				CARIBBEAN				CENTRAL AMERICA			
	FY88	FY89	FY90	FY91	FY88	FY89	FY90	FY91	FY88	FY89	FY90	FY91
AGRICULTURE (total)	40062	16871	43426	22563	15563	23599	19004	18916	37002	90555	74331	91542
Ag'l Research	= 7737	4830	5668	4033	1779	3261	6326	6436	6614	3971	3422	525
Ag'l Extension	= 7505	5245	7824	5973	3733	6243	4890	5571	4363	8395	4268	2637
Ag'l Education	= 1910	1096	622	419	0	1800	1671	1025	2347	11226	816	892
Ag'l/Nutrition Mgmt , Planning & Policy	=	1629				572				279		
Ag'l Land Use & Settlement	= 515	130	525	935	815	1175	1113	600	323	557	2110	2330
Ag'l Policy	= 1022	598	1611	1957	86	392	1180	1311	965	28490	47993	68280
Ag'l Inputs	= 50	130	250	160	81	2238	30	15	464	1574	1137	33
Ag'l Irrigation	= 0	0	0	0	3165	971	184	127	1718	3758	3773	3710
Pest Management	= 43	0	84	72	0	0	377	400	875	1779	1057	663
Ag'l Credit	= 10623	1209	5134	1537	3938	2226	603	607	2870	11759	4996	6832
Ag'l Marketing	= 174	184	320	628	84	884	1079	1168	2648	2760	1543	615
Agribusiness	= 8252	1356	16515	1271	1282	958	1151	1056	2901	12934	422	1505
Infrastructure (Rural Roads)	= 2231	464	4873	5578	600	2879	400	600	10914	3073	2794	3620
NATURAL RESOURCES/ ENVIRONMENT (total)	7281	1277	2801	2340	5845	7641	8302	7182	5358	18304	20941	20303
Forestry	= 856	1023	1421	1144	1950	2565	3366	3801	4151	6500	6728	5731
Environmental Mgmt , Planning/Policy	= 1370	150	1122	1016	2109	3243	2529	1201	683	8017	8924	5669
Soils	= 55	104	258	180	110	44	283	360	0	1240	1700	1100
Ag'l Land Development	= 0	0	0	0	815	1235	1881	1520	124	40	58	103
Water Resources Mgmt	= 0	0	0	0	381	45	0	0	400	2507	3331	7450
Energy (Fuelwood)	= 5000	0	0	0	480	509	243	300	0	0	200	250
NARCOTIC AWARENESS	= 0	0	0	125000	0	0	0	0	0	0	0	0
GRAND TOTALS	= 47343	18148	46227	149903	21408	31240	27306	26098	42360	108859	95272	111845

^aIn 1988, AID/W funded a review of over 1,000 projects active under AID's Agriculture, Rural Development, and Nutrition (ARDN) funding account for FY84-FY89 or proposed for FY90. That review was conducted by Chemonics International and summarized in LAC TECH's Ag REE Inventory. LAC ARDN portfolio refers to the USAID projects funded under the ARDN account.

EXHIBIT 10

LAC Bureau ARDN Portfolio Summary by Strategic Funding Categories (FY88-FY91).
Percentages by Subregion (* = less than one-tenth of one percent)

STRATEGIC CATEGORY	ANDEAN				CARIBBEAN				CENTRAL AMERICA			
	FY88	FY89	FY90	FY91	FY88	FY89	FY90	FY91	FY88	FY89	FY90	FY91
AGRICULTURE (total)	84.6	93.0	93.9	14.9	72.7	75.5	69.6	72.4	87.4	83.2	78.0	81.7
Ag'l Research	= 16.3	26.6	12.3	2.7 a)	8.3	10.4	23.2	24.7	15.6	3.6	3.6	0.5
Ag'l Extension	= 15.9	28.9	16.9	4.0 a)	17.4	20.0	17.9	21.3	10.3	7.7	4.5	2.4
Ag'l Education	= 4.0	6.0	1.4	0.3 a)	0	5.8	6.1	3.9	5.5	10.3	0.9	0.8
Ag'l/Nutrition Mgmt , Planning & Policy	=	9.0				1.8				0.3		
Ag'l Land Use & Settlement	= 1.1	0.7	1.1	0.6	3.8	3.8	4.1	2.3	0.8	0.6	2.2	2.0
Ag'l Policy	= 2.2	3.3	3.5	1.3	0.4	1.2	4.3	5.0	2.3	26.2	50.4	61.0
Ag'l Inputs	= 0.1	0.7	0.5	0.1	0.4	7.2	0.1	0.1	1.1	1.4	1.2	*
Ag'l Irrigation	= 0	0	0	0	14.8	3.1	0.7	0.5	4.1	3.4	4.0	3.3
Pest Management	= 0.1	0	0.2	*	0	0	1.4	1.5	2.1	1.6	1.1	0.6
Ag'l Credit	= 22.4	6.7	11.1	1.0	18.4	7.1	2.2	2.3	6.8	10.8	5.2	6.1
Ag'l Marketing	= 0.4	1.0	0.7	0.4	0.4	2.8	3.9	4.5	6.2	2.5	1.6	0.5
Agribusiness	= 17.4	7.5	35.7	0.8	6.0	3.1	4.2	4	6.8	11.9	0.4	1.3
Infrastructure (Rural Roads)	= 4.7	2.6	10.5	3.7	2.8	9.2	1.5	2.3	25.8	2.8	2.9	3.2
NATURAL RESOURCES/ ENVIRONMENT (total)	15.4	7.0	6.1	1.6	27.3	24.5	30.4	27.6	12.6	16.8	22.0	18.2
Forestry	= 1.8	5.6	3.1	0.8	9.1	8.2	12.3	14.6	9.8	6.0	7.0	5.1
Environmental Mgmt , Planning/Policy	= 2.9	0.8	2.4	0.7	9.9	10.4	9.3	4.6	1.6	7.4	9.4	5.1
Soils	= 0.1	0.6	0.6	0.1	0.5	0.1	1.0	1.4	0	1.1	1.8	1.0
Ag'l Land Development	= 0	0	0	0	3.8	3.9	6.9	5.8	0.3	*	0.1	0.1
Water Resources Mgmt	= 0	0	0	0	1.8	0.1	0	0	0.9	2.3	3.5	6.7
Energy (Fuelwood)	= 10.6	0	0	0	2.2	1.6	0.9	1.2	0	0	0.2	0.2
NARCOTIC AWARENESS	= 0	0	0	83.4	0	0	0	0	0	0	0	0
GRAND TOTALS	= 100	100	100	100	100	100	100	100	100	100	100	100

a) For South America FY91, percentages (if not include Narcotic Awareness) for research, extension, and education are 16.2%, 24.0%, and 1.7%, respectively

EXHIBIT 11

Trends in LAC ARDN Funding for Agricultural Research, Extension, and Education Comparison Across Subregions

	<u>Research</u>			<u>Extension</u>			<u>Education</u>		
	<u>AR</u>	<u>CA</u>	<u>CN</u>	<u>AR</u>	<u>CA</u>	<u>CN</u>	<u>AR</u>	<u>CA</u>	<u>CN</u>
	%			%			%		
FY88	16.3	15.6	8.3	15.9	10.3	17.4	4.0	5.5	0.0
FY89	26.6	3.6	10.4	28.9	7.7	20.0	6.0	10.3	5.8
FY90	12.3	3.6	23.2	16.9	4.5	17.9	1.4	0.9	6.1
FY91	2.7	0.5	24.7	4.0	2.4	21.3	0.3	0.8	3.9

Key AR = Andean Region, CA = Central America, CN = Caribbean Region

Source Exhibit 10

Exhibit 12 provides sub-regional comparisons of the trends in LAC ARDN funding for Ag REE. The Andean and Central American regions experienced similar downward trends in funding for Ag REE. In the Central American region, ARDN funding for education fell by 85%, research by 97%, and extension by 77%, while ARDN funding in the Andean region fell 93% for education, 84% for research, and 75% for extension. As a result, ARDN funding for Ag REE now comprises only 7% of the Andean portfolio and less than 4% of the Central American portfolio. Only the Caribbean region experienced an increase in ARDN funding, with funding for education going from 0% to nearly 4% of the ARDN portfolio in the region, research increasing by nearly threefold (from 8.3% to 24.7%), and extension increasing by over 20% (from 17.4% to 21.3%).

EXHIBIT 12

Sub-regional Trends in LAC ARDN Funding for Agricultural Research, Extension, and Education by Subregion Comparison Across Categories for Each Subregion

	<u>Andean</u>			<u>Caribbean</u>			<u>Central America</u>		
	<u>RES</u>	<u>EXT</u>	<u>EDU</u>	<u>RES</u>	<u>EXT</u>	<u>EDU</u>	<u>RES</u>	<u>EXT</u>	<u>EDU</u>
	%			%			%		
FY88	16.3	15.9	4.0	8.3	17.4	0.0	15.6	10.3	5.5
FY89	26.6	28.9	6.0	10.4	20.0	5.8	3.6	7.7	10.3
FY90	12.3	16.9	1.4	23.2	17.9	6.1	3.6	4.5	0.9
FY91	2.7	4.0	0.3	24.7	21.3	3.9	0.5	2.4	0.8

Source Exhibit 10

Notes to Exhibits 9-12

Exhibits 9-12 summarize funding trends for agricultural research, extension, and education by LAC subregion Central America (CA), the Caribbean (CN), and the Andean Region (AN). The percentages in exhibit 10 are based on the dollar figures in exhibit 9, while exhibits 11 and 12 are taken directly from exhibit 10.

As the reader may see in exhibit 11, funding for agricultural research as a percentage of total LAC ARDN funding fell by nearly 97% in Central America (15.6% in FY88, 0.5% in FY91) and by over 84% in the Andean Region (16.3% in FY88, 2.7% in FY91), while funding for agricultural research in the Caribbean nearly tripled (8.3% in FY88, 24.7% in FY91).

In agricultural extension, funding as a percentage of total LAC ARDN funding fell by nearly 77% in Central America (10.3% in FY88, 2.4% in FY91) and by nearly 75% in the Andean Region (15.9% in FY88, 4% in FY91), although funding for agricultural extension in the Caribbean increased by nearly 25% (17.4% in FY88, 21.3% in FY91). Yet, overall, the funding trends in agricultural extension in each subregion were parallel to those in agricultural research.

In agricultural education, funding as a percentage of total LAC ARDN funding fell by over 85% in Central America (5.5% in FY88, 8% in FY91) and by nearly 93% in the Andean Region (4% in FY88, 3% in FY91), while funding for agricultural education in the Caribbean increased from 0% to an average of 5% for the period (but 3.9% in FY91). The funding trends in agricultural education in each subregion were parallel to those in agricultural research and extension.

EXHIBIT 13

Agricultural Research Indicators in the LAC Region (adapted from Pardey and Roseboom, 1989)

REGION/COUNTRY	Ph D	M Sc	B Sc	Sub- total	Ex- pats	Total	Research Expenditures		In Constant 1980 US\$ PPP	Principal Research Organization
							%Change Researchers Since 1980	% Change Since 1980 in Constant LCUs		
ANDEAN REGION										
Bolivia (83) ^a	2	31	54	87	17	104	-8 8	-50 6 (83)	2 224 (83)	IBTA
Ecuador (86)	5	67	153	225	*	225	+12 5	-39 2 (86)	10 973 (86)	INIAP
Perú (80)	4	30	239	273	*	273 (85)	0 0	+200 2 (84)	24 759 (84)	INIAA
CARIBBEAN										
Dominican Rep (83)	2	29	105	136	0	136	+28 3	+37 2 (83)	4 766 (83)	DIA/SEA
Haiti (83)	7	23	2	32	*	32	*	+112 8 (83/78) ^b	1 623 (83)	CDRA
Jamaica (80)	4	23	22	49	*	49	*	* -49 3 (81/71)	2 399 (81)	MOA & CARDI
CARDI (all)										
OECS										
Antigua (84)	1	3	1	5	*	5	+66 7	*	*	
Dominica (83)	0	2	4	6	*	6	*	-51 1 (84/82)	103 (83)	MOA
Montserrat (84)	0	1	1	2	*	2	*	*	*	
St. Kitts-Nevis (84)	1	3	2	6	*	6	+100 0	+8 3 (83)	061 (81)	
St Lucia (87)	6	5	10	21	0	21	*	*	1 791 (83)	MOA, WINBAN
St Vincent (86)	0	2	2	4	1	5	-20 0	*	*	
CENTRAL AMERICA^c										
Belize (82)	*	*	*	*	*	16	*	*	*	DOA/RD
Costa Rica (84)	*	*	*	*	*	114 (81)	*	-54 0 (84)	1.984 (84)	DIA
El Salvador (80)	*	*	*	*	*	106	*	* (80)	4 454 (80)	CENTA
Guatemala (85)	2	25	101	128	4	132	+10 0	-11 1 (84)	6 801 (84)	ICTA
Honduras (82)	*	*	*	*	*	65	-8 4	* (80)	1 554 (80)	PNIA
Nicaragua (80)	*	10	47	*	*	57	*	* (80)	3.610 (80)	MAG/INTA
Panamá (86)	9	41	90	140	*	140	+118	+11 3 (85)	5 729 (85)	IDIAP

* = Data not available or inadequate to calculate indicator

^a Year in parentheses is most recent year for which data are available or was year used in calculating the indicator

^b Most recent year relative to present year.

^c The data are specific to countries and do not include those researchers working at CATIE as a regional research institution

EXHIBIT 14

Comparison of researchers and expenditures for INIAs between 1981-85 and 1992-93 (Source Lindarte, 1995 31)				
Country	INIAs (1981-85)		INIAs (1992-93)	
	Researchers (# of people)	Expenditure (US\$million 1992)	Researchers (# of People)	Expenditures (US\$million 1992)
Southern				
Argentina	1,062	46 7	1,015	70 4
Brazil	1,610	284 9	2,088	217 3
Paraguay	86	11 8	112	1 6
Uruguay	77	4 3	126	12 6
SUBTOTAL	2,835	311 7	3,341	301 9
Andean				
Bolivia	104	1 3	115	5 0
Colombia	403	19 9	422	18 8
Ecuador	211	11 9	238	4 3
Peru	262	13 8	153	22 7
Venezuela	383	44 7	504	20 6
SUBTOTAL	1,363	91 6	1,432	71 4
Central American				
El Salvador	75	4 5	99	0 8
Guatemala	160	6 8	164	4 3
Honduras	65	2 6	62	0 5
Mexico	1,058	114 3	1,716	83 6
Panama	115	7 0	124	5 4
SUBTOTAL	1,473	135 2	21,654	94 6
TOTAL	5,671	538 5	6,938	467 9

EXHIBIT 15

Major Constraints to Productive and Sustainable Agricultural Extension

Funding

- Recurrent cost funding problems during and subsequent to the project which seriously inhibit field operations

Basis for Recommendations

- Inadequate research-extension linkages to ensure the technological needs of some of the major farming systems are defined and addressed (especially for resource-poor and less predictable environments)
- Insufficient technology available to enable a major and progressive program to improve production in some important farming systems
- An entrenched "top-down" approach in developing recommendations, despite objectives of continuous feedback from farmers
- Little or negligible consideration of production economics, risks, and different degrees of access by farmers to resources

Human Resource Capacity

- Training programs unable to ensure front-line extension staff had sufficient practical knowledge of production systems (and their constraints and potentials) and of relevant technology, to provide the desired level of interaction with farmers
- Specific mention of low education level of front-line staff limiting the potential for a more analytical and responsive service

Selection of Methodologies

- The adoption of a methodological "blueprint" approach over a large area (region, state, nation) did not permit a desirable adaption of services to the circumstances of each area, greater resources should have been allocated in the preparation phase to make the project more responsive to fiscal/institutional/farming system conditions
- "Contact farmer" system not very effective, or reference made to better results from working with farmer groups

Commitment-Ownership

- Government, implementing agency management or staff not fully committed to all the principles and procedures of the extension program
- Monitoring activities very weak, or, if developed, not effectively used for responsive management

Source World Bank (1994 18)

EXHIBIT 16

Major Technical Findings of World Bank Review of 20 Agricultural Extension Projects in the LAC Region.

- 1 Intensive and integrated technical assistance complementing input supply and adequate investment and production credit in appropriate production programs is likely to be effective in improving income for the target producer group, however, such services are relatively costly per smallholder client. Also, as evidenced in other regions, technical assistance/credit programs for smallholder producers were often directed at the more progressive farmers with higher resources. Thus, in public sector schemes, normally scarce resources become concentrated on a limited number of producers and thereby reduce extension's responsiveness to households with less resources.
- 2 In extension programs based on the integrated rural development model, the assumption was made that extension services would be continued after project completion, however, major funding difficulties typically were encountered when services were more staff-intensive and more demanding in operational support funds than the regular public extension services could finance.
- 3 Without knowledge of the target farming systems to define technology needs, effective links with research to access appropriate improved technology, adequate numbers of staff trained in the practical aspects of production, and adequate funding to support field operations, it is unlikely that agricultural extension can achieve satisfactory results in expanding intensive technical services from a limited clientele to a broader, less intensive coverage.
- 4 Integrated services that include extension are likely to achieve satisfactory results if targeted on higher potential production environments (existing, or created through a project or prior investment). On the other hand, in production environments that are characterized by severe constraints, public funds may be invested more wisely in programs to reduce poverty than in agricultural extension, unless a justification can be made that public investment can substantially improve the production environment.
- 5 Where there are widely recognized problems (e.g., a disease or pest outbreak), well-organized campaigns to respond to such problems in a limited time frame can avoid many of the constraints faced by "permanent" services and can be an effective use of public sector resources. However, special, short-lived campaigns "depend on the availability of suitable public sector personnel to respond to the crisis, and do not substitute for the development of a public sector institutional capacity to deliver effective extension services, should the latter be deemed necessary to enhance [smallholder] productivity" (World Bank, 1944:39).
- 6 Except for systems in which parastatals made deductions from commodity payments, or credit agencies included an interest rate spread to obtain some cost recovery for services, there was only one example (Chile) of private sector services by consultants who provided subsidized technical assistance to commercial small farmers. This approach can have several advantages—highly professional staff, achievement of good results, and reduction of public sector service costs. But target producers must have the financial resources (i.e., commercial production with significant cash income) to pay for technical assistance, although the public sector can provide incentives to foster greater private sector entry to and participation in providing agricultural extension services. Yet public services for the private good of smallholder families in the poorer smallholder subsector of many developing countries is needed and justified on economic and poverty alleviation grounds. There will be rapid change in the agricultural sector in the coming decade, especially in middle-income developing countries, hence, public extension service should look for opportunities to move to a system of payment for services as this capacity develops, thereby reducing fiscal costs and enhancing technical service effectiveness through client ownership.

7 Generally, the T&V model has not been used widely in the LAC region. The region has made greater progress than other World Bank-assisted regions in involving the private sector in extension for commercial production by small holders, in government contracting the private sector to provide services to marginalized farmers (e.g., Chile), and in determining some degree of payment for public service at the individual or local community level (e.g., Colombia). The Bank also notes that the provision of services by farmer associations is widely developed among small holders in commercial production, often along commodity lines through deductions from commodity prices as the means to pay for technical services.

8 The analysis rated most of the five Mexican agricultural credit projects as unsatisfactory because of the limited coverage of the smallholder population, especially those small holders with less resources. By contrast, the area development projects delivered intensive services and were reasonably effective. Two of the three projects attempted to apply principles drawn from the earlier and successful "Plan Puebla" model. This model was based on technical and socioeconomic diagnostic work in the area by an interdisciplinary project team, followed by testing and promotion of relevant technology in selected communities using well-trained university graduates as the extension agents. However, these principles were considerably diluted in the area development projects (Loan 1553 and 1945-MX). This large project included production and social infrastructure investments including subsidized credit. While the project was effective in undertaking diagnostic surveys in support of a well-coordinated adaptive research and extension program, effectiveness was reduced by a decline in the degree of experience of project staff.

A significant problem with the area development project is the relatively high public sector cost, especially when the costs to be covered include not only extension but also major infrastructural and credit investments, for a limited number of districts, thus limiting the potential of this model as a way to respond to the technology needs of the rural poor. The third area development project (the PIDER program), while similarly linked to production investments, did not include the same emphasis on diagnostic work or research-extension links and was not as effective as the models previously described.

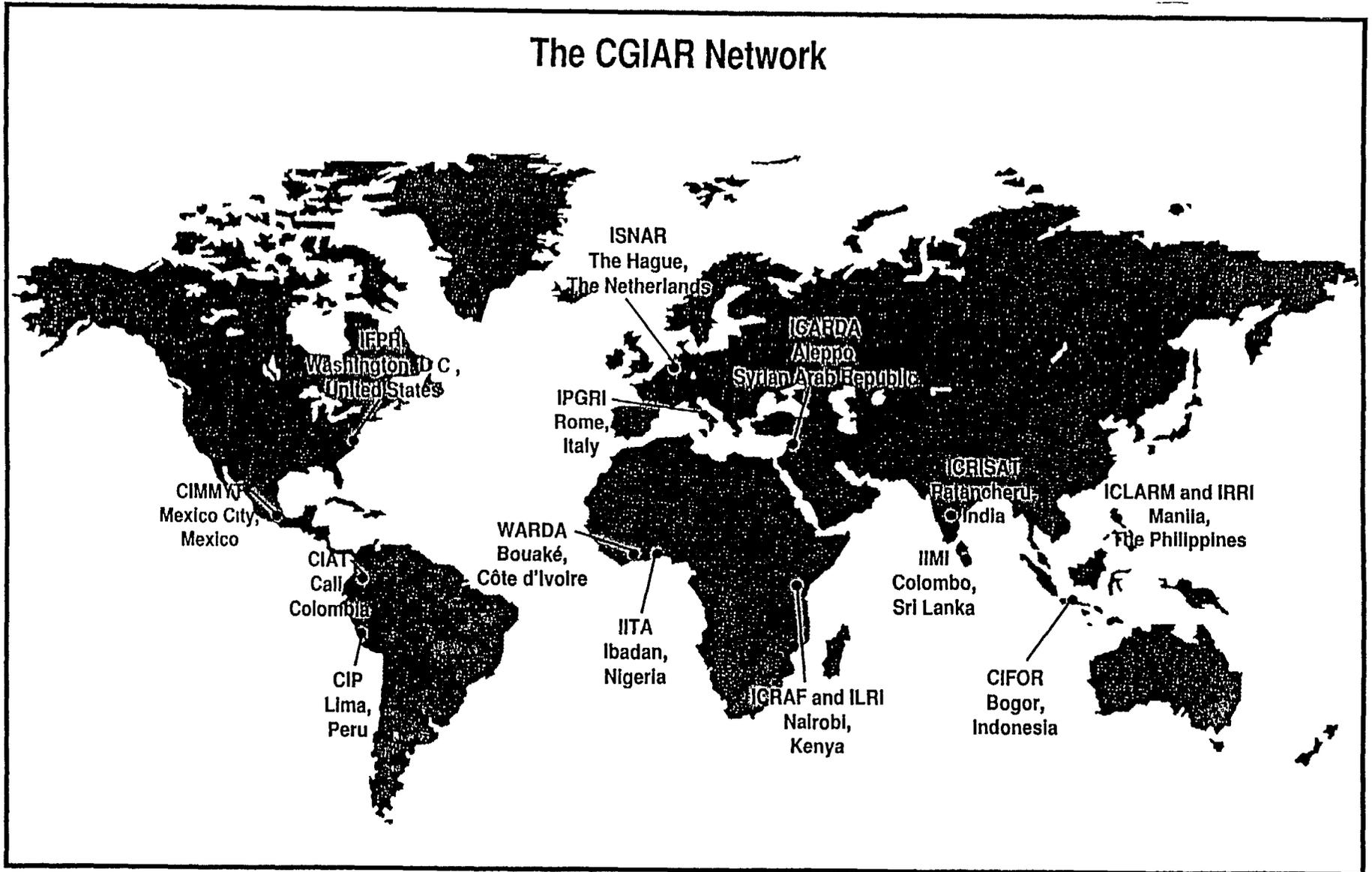
9 The aforementioned project in Chile (Loan 2481-CH) included credit with private sector consultants providing technical assistance to small commercial farmers. The project was directed at small farmers with holdings of 8 to 12 potentially irrigated ha equivalents (a local measure). Technical assistance under the project was obligatory for credit recipients for three years, with the credit being subsidized by a government agency (INDAP) under a graduated cost sharing formula. Consultants were approved by INDAP, and their performance was monitored. The service provided under this model was rated as effective in achieving technology adoption and the resulting commodity production levels. Near the end of the project, the program was redirected to smaller farmers with less resources, and support for this group is being continued under an ongoing project (Loan 3473-CH).

10 A similar project is being funded by USAID in Guatemala to help a number of smallholder producers access technology to produce and market horticultural crops under irrigation. This Guatemalan project also applies a cost sharing formula in which growers pay each season a progressively higher percentage of the technical assistance fee, with the portion covered by the project gradually being phased out.

It is too early to assess the results of this model as applied in Chile and Guatemala, however, preliminary evidence appears encouraging. The model merits consideration in formulating a country's agricultural extension policy especially where a country seeks to move larger numbers of smallholder producers into the production of commercial crops (e.g., horticultural crops -- fruits and vegetables) for sale in domestic, regional, or international markets. A closely related problem is that the skill mix of researchers often reflects science and technology needs as perceived when these researchers received their scientific training 20 years ago. Yet, given scientific and technological advances during the past two decades (e.g., biotechnology), as well as dramatic changes now taking place in the region's movement toward a Free Trade Area of the Americas, a mix of new skills is now needed. Thus, how the LAC countries re-engineer the region's agricultural education institutions to better meet the emerging needs is a basic challenge that must be addressed if these countries are to become competitive in the Hemisphere's free trade market place.

EXHIBIT 17

The CGIAR Network



A-17

EXHIBIT 18

Decline in USAID's Ag. Sector Funding

(Source Office of Agriculture and Food Security Data Base,
USAID Washington D C October 1995)



EXHIBIT 19**Current LAC USAID projects related to Trade Liberalization (By Country)**

BOLIVIA Industrial Transition Export Promotion Micro & Small Enterprises Strengthen Financial Markets Technical Support/Policy Reform Microfinance Economic Recovery	HONDURAS Small Business Development II Policy Analysis and Implementation Small Farmer Agribusiness Development Economic Policy and Productivity Small Farmer Export Development Postharvest Collaboration with Agribusiness Microenterprise Innovation
DOMINICAN REPUBLIC Economic Policy and Practice Trade Practices and Productivity Improvement University Agribusiness Partnership Micro and Small Business	JAMAICA Export Development and Investment Promotion Microenterprise Development Agricultural Export Service North Coast Development Crop Diversification/Irrigation Hillside Agriculture
ECUADOR Agricultural Sector Re-orientation Nontraditional Exports Trade and Investment Agricultural Research Extension and Education	MEXICO NAFTA Legal/Regulations NAFTA-Trade 2000
EL SALVADOR Peace and National Recovery Small Enterprise Support Microenterprise Development Social/Economic Policy Reform Industrial Reconstruction	PANAMA Economic Policy Development Trade and Investment
GUATEMALA Small Farmer Coffee Trade/Labor Relations Private Enterprise Development	PERU Strengthening the Private Sector Microenterprise Support Stabilization Trade and Marketing Employment and Natural Resources
GUYANA Agricultural Sector Reform Building Equity and Economic Partnerships	RURAL DEVELOPMENT OFFICE/CARIBBEAN Infrastructure Expansion and Maintenance West Indies Tropical Produce Caribbean Policy Project Environment and Natural Resources
G-CAP Export Agribusiness Development and Promotion Economic Policy Research Export Industry Technology Policy Trade and Economic Integration	

Source USAID/LAC/RSD/BBEG, 1995

EXHIBIT 20

IARC Funding

(Source Office of Agriculture and Food Security Data Base, USAID Washington D C October 1995)

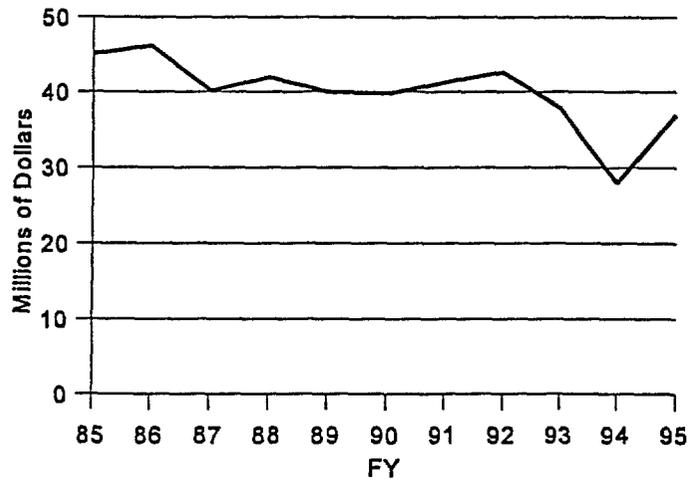
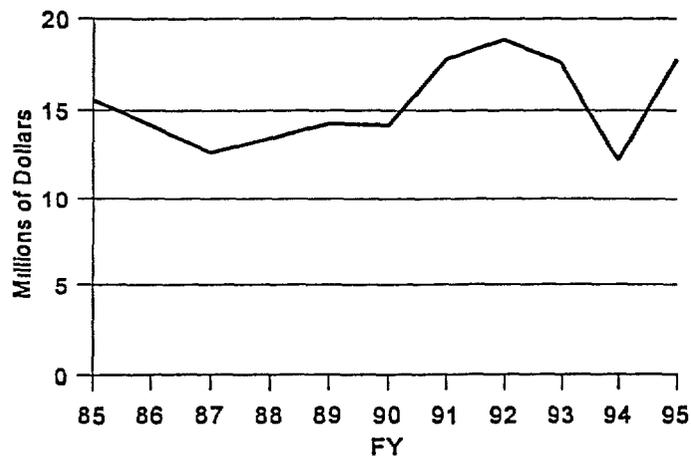


EXHIBIT 21

CRSP Funding

(Source Office of Agriculture and Food Security Data Base, USAID Washington D C October 1995)



04

EXHIBIT 22 - University Curricula and Program Adjustments To Respond To Changing US/Hemispheric/Global Needs

The TIAFTA study included surveys of various agricultural technology institutions, some of which were U S land grant universities. For these universities, the basic areas of query dealt with future shifts foreseen in their state's agricultural economy, adjustments anticipated in research, extension, and education in light of these changes, suggestions they might provide at this juncture of the TIAFTA study, and related points. Those universities which replied indicated very strong support of the TIAFTA study and provided some interesting observations. Examples from the University of California, Davis and Texas A&M University indicate some of the changes underway or anticipated.

University of California, Davis (UCD) - UCD reports that it's whole program is placing increased emphasis on global issues of mutual interest in graduate and undergraduate instruction. For example, in agriculture, an increased proportion of the research activities will focus on international agricultural trade-related matters. Such activities include 1) the effect of NAFTA and the devaluation of the Mexican peso on agricultural trade and migration, 2) the effect of the growth of regional trading blocs on agricultural trade and economic welfare, 3) an analysis of the available bio-diversity for crop breeding programs in major crops, 4) the effect of changing economic policies on Pacific Rim agricultural trade, 5) the effect on world beef markets if Argentina and Uruguay achieve foot and mouth disease free status, 6) effects of harmonization of agricultural policies between Canada and Mexico, and 7) effects on global food markets of economic reform and integration in North East Asia. Particularly noteworthy programs which will probably receive increased attention are 1) agricultural economics, 2) food science, 3) integrated pest management, 4) meteorology and climatology (of increased importance due to global warming), 5) pomology, and 6) ecology. Efforts are now underway to convert the Small Ruminants CRSP to a global livestock support program.

In addition, UCD maintains programs which link scientific contacts in the agricultural sector throughout LAC. For example MEXUS, promotes scientific exchanges between UCD and Mexico and also the Pacific Rim Program which includes links with those LAC countries bordering the Pacific.

Texas A&M University - Texas A&M's focus in the future will generally deal with food distribution systems. Within LAC, more opportunities will be provided to engage in a variety of hemispheric interactions. The examples cited include 1) students will be bilingual with knowledge of food preferences, 2) ongoing student internships in LAC will expand, 3) extension programs will be designed to respond to the producers and consumers in Mexico and Texas, 4) regionally-focused short courses will be increased, and 5) faculty-based efforts to orient research, extension, and education needs towards LAC issues will also be increased. Academic programs of particular interest to the TIAFTA agenda include world food distribution systems, food harvest, safety, and processing, integrated pest management, production agriculture, agribusiness and agriculture trade policy, and natural resource impact assessments. They also commented that subject matter from the liberal arts areas will have to increase as human communication aspects are so basic for enabling the U S to be competitive within the global economy.



ANNEX B - Changing Trends in LAC Agriculture

Notes on graphs

Only countries with population over two million are shown in the graphs of this annex

Members of regional trade groupings are as follows

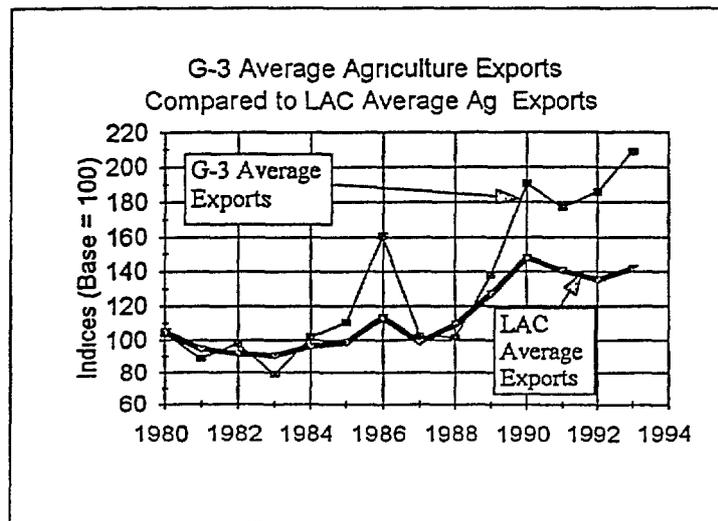
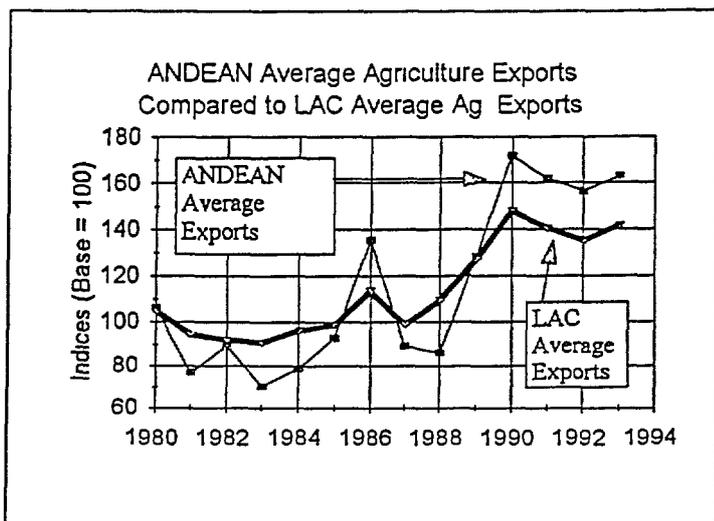
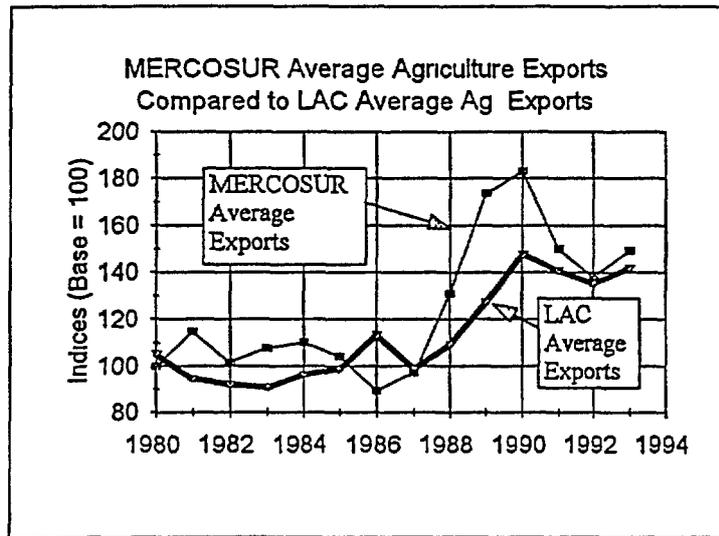
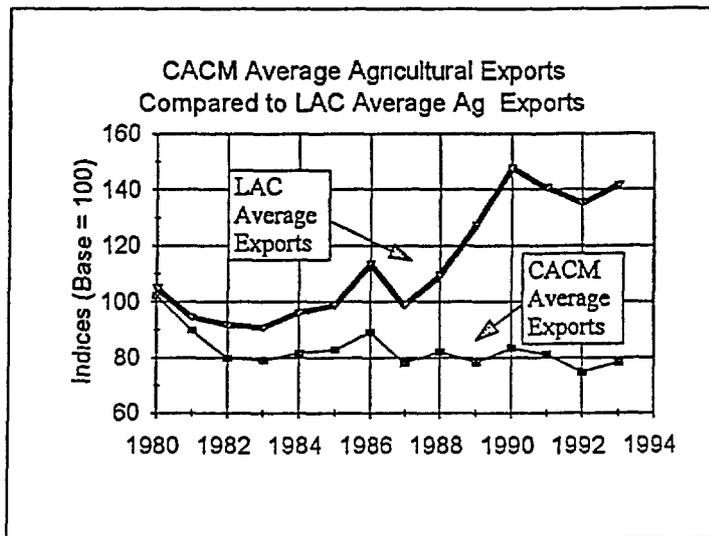
CACM (Central American Common Market)	Andean Group (also known as GRAN)	MERCOSUR (Southern-Cone Common Market)	G-3
Costa Rica El Salvador Guatemala Honduras Nicaragua	Bolivia Colombia Ecuador Peru Venezuela	Argentina Brazil Paraguay Uruguay	Colombia Mexico Venezuela

The graphs included in this chapter are based on index numbers taken from the FAO's AGROSTAT Database. The FAO index numbers may differ from those produced by the countries themselves because of differences in concepts of production, coverage, weights, time reference of data (the database uses calendar years), and methods of calculation. The following information is paraphrased from the database manuals.

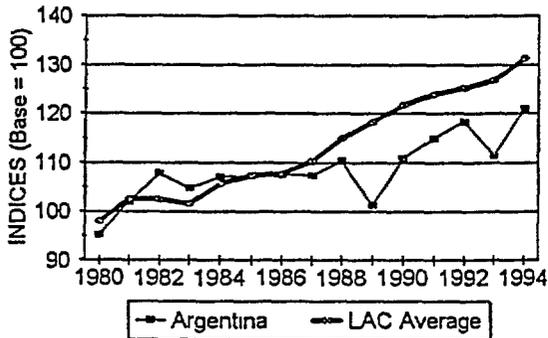
The index numbers show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 1979-1981. They are based on the sum of price-weighted quantities of agricultural commodities after quantities of seed and feed (weighted in a similar manner) are deducted. In other words, the disposable production for any use except as seed and feed. All intermediate inputs of agricultural origin are deducted.

The country indices are calculated by the Laspeyres formula. Production quantities of each commodity are weighted by 1979-81 average national producer prices (expressed in terms of "international dollars" using the Geary-Khamis formula for the agricultural sector) and summed for each year. Therefore, the computation is restricted to commodities where there is both production and price information.

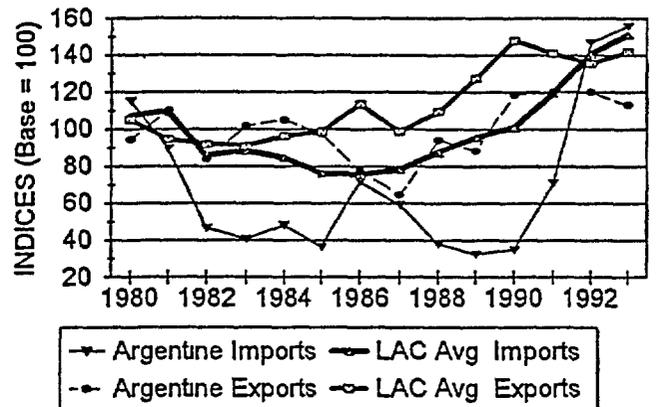
The commodities covered in the computation of index numbers of agricultural production are all crops and livestock products originating in each country on which information is available. Practically all products are covered with the main exception of fodder crops.



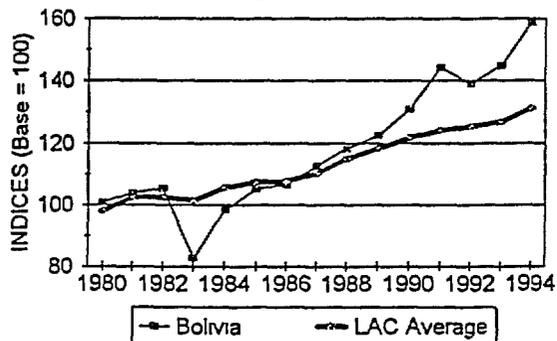
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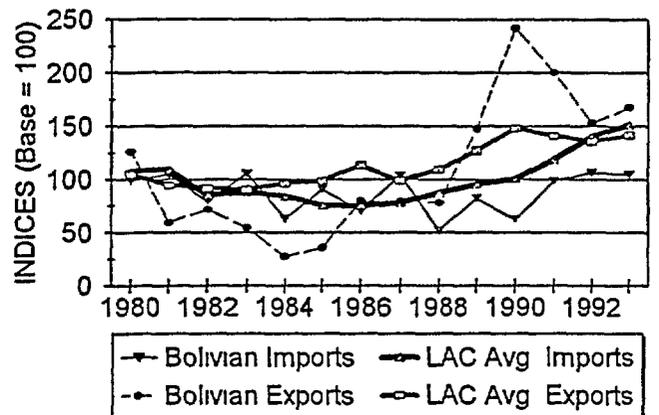
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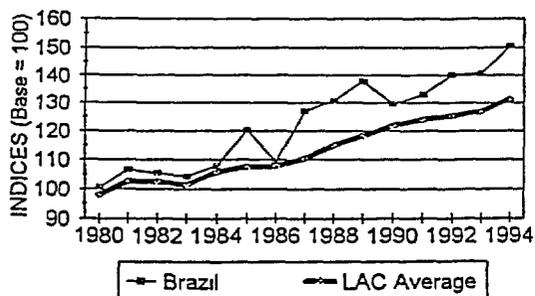
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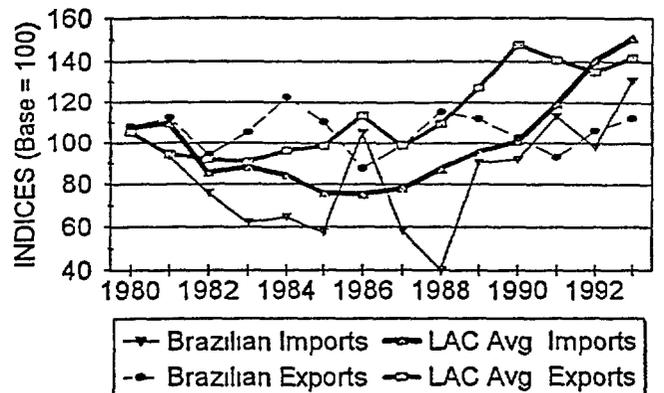
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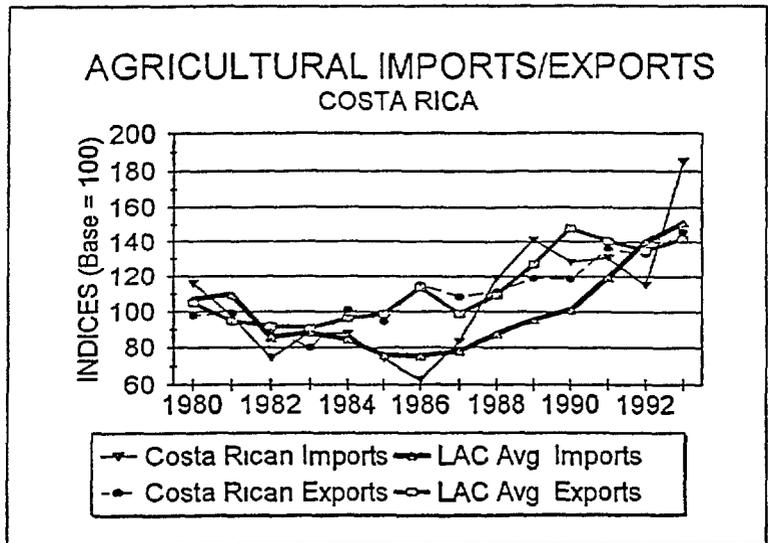
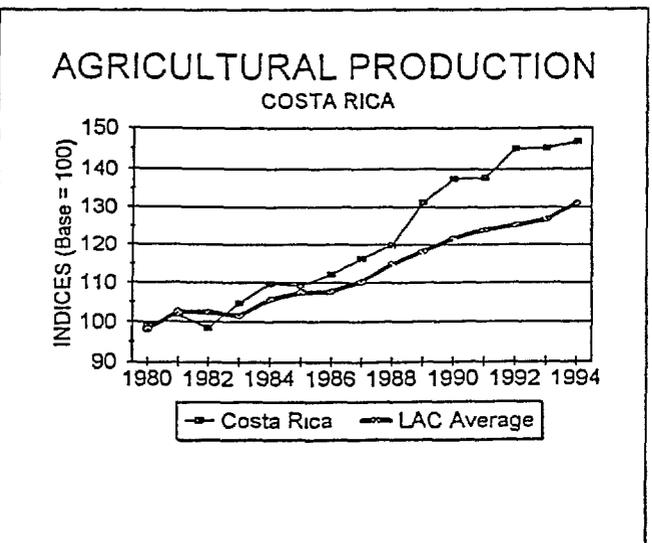
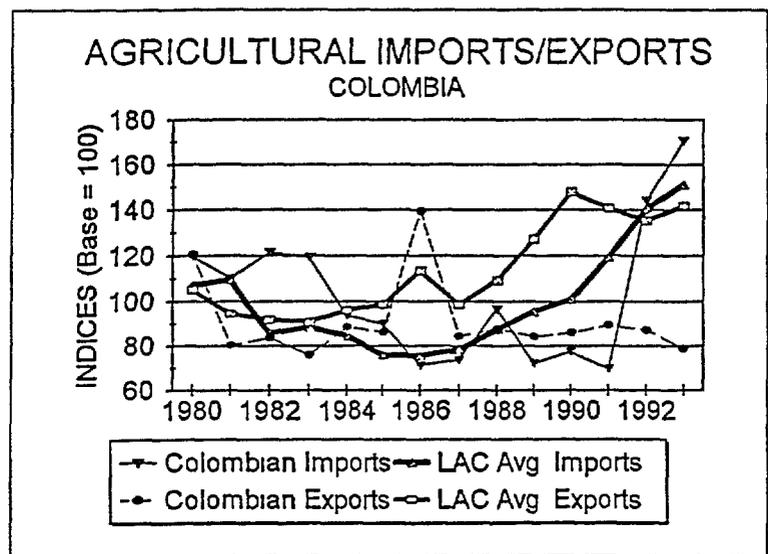
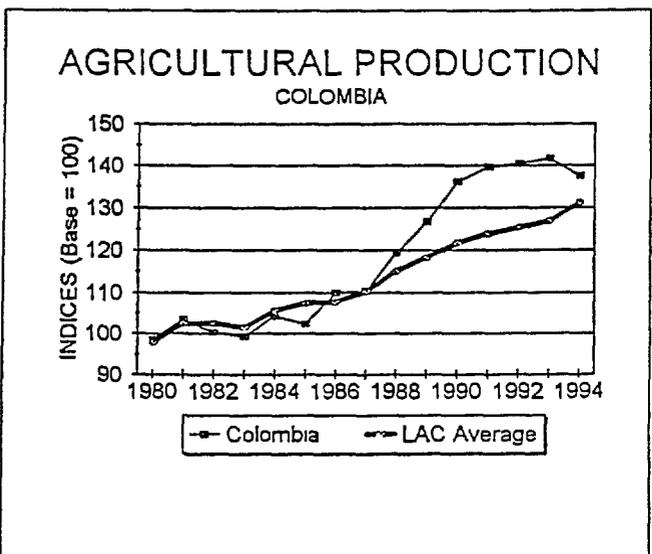
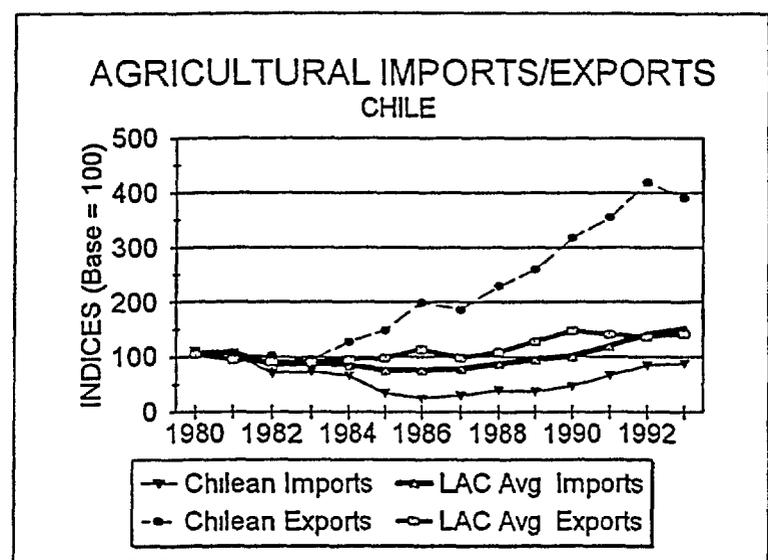
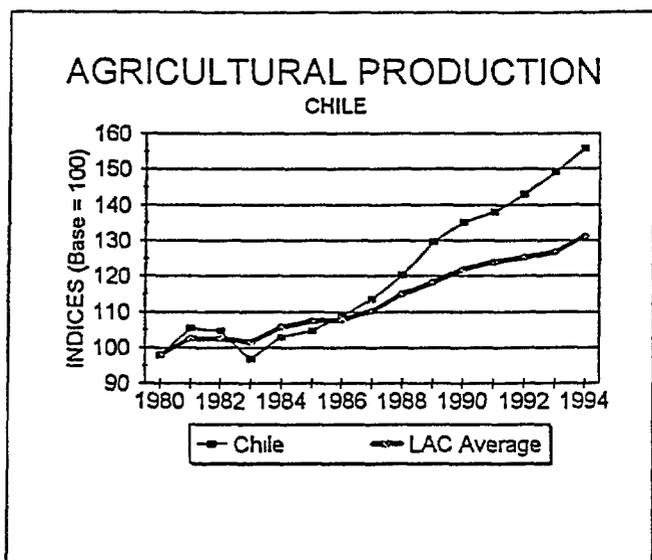


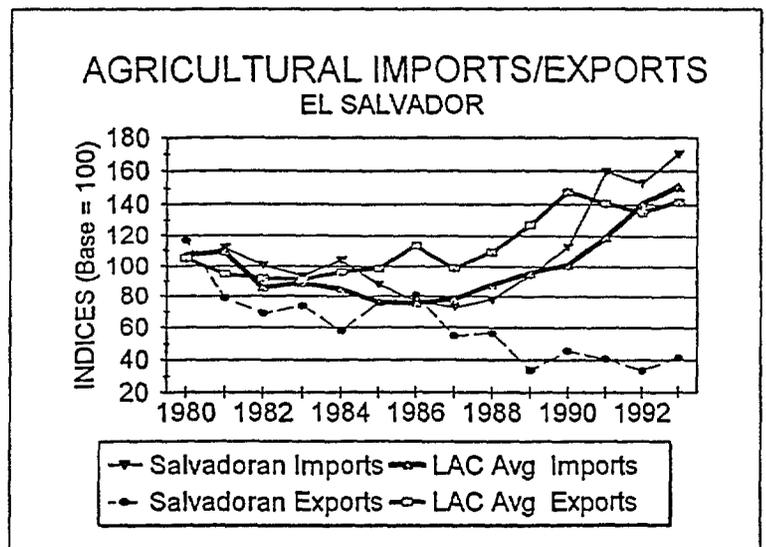
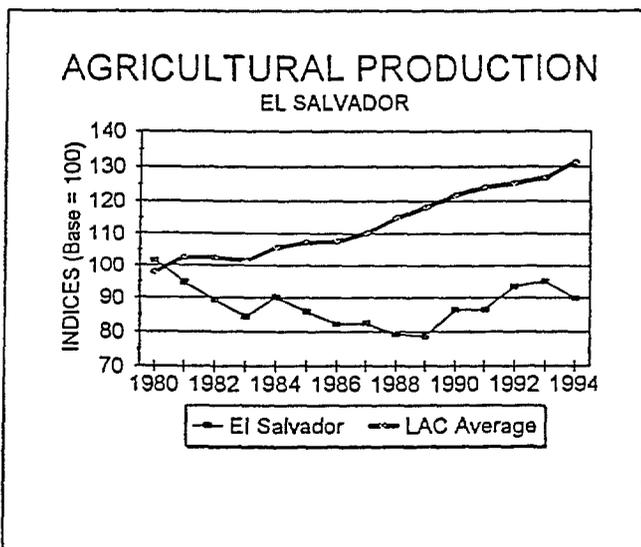
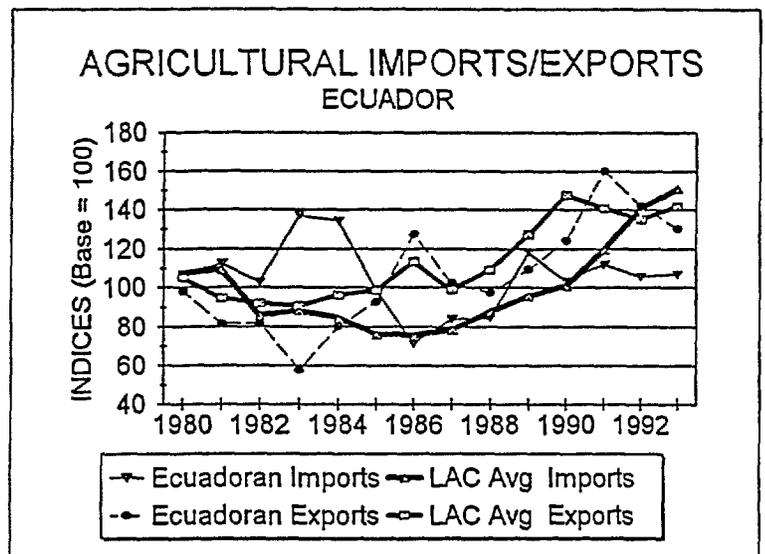
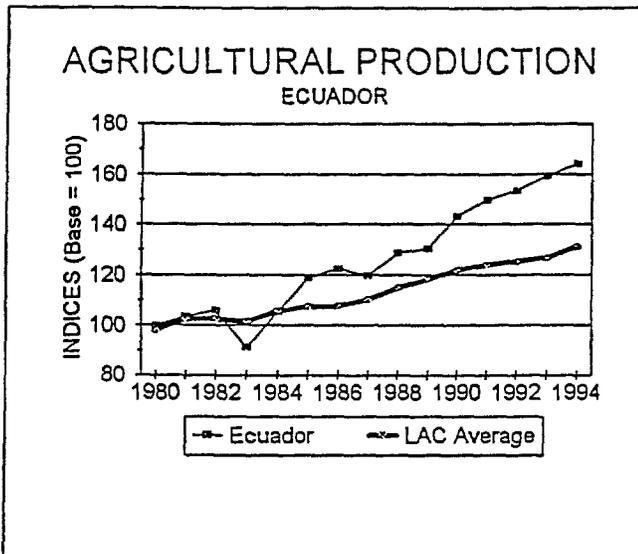
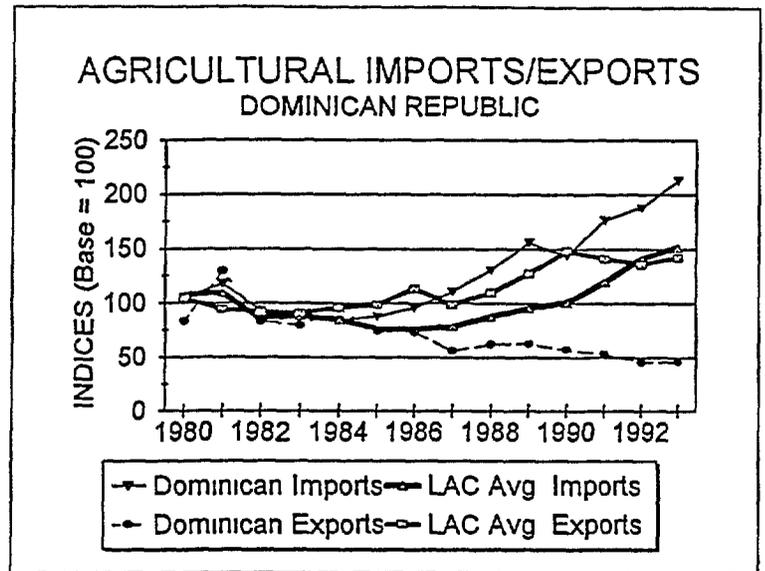
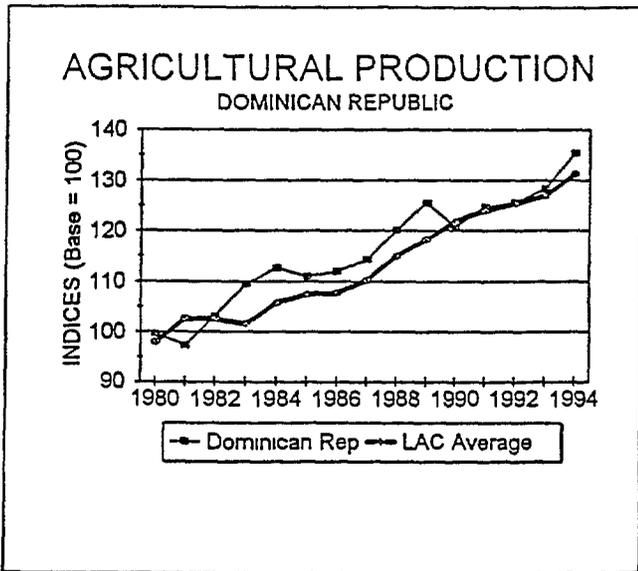
AGRICULTURAL PRODUCTION BRAZIL

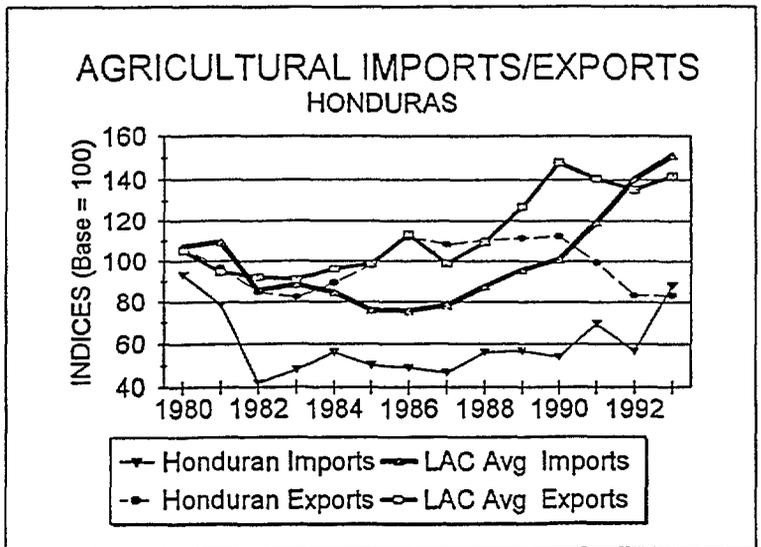
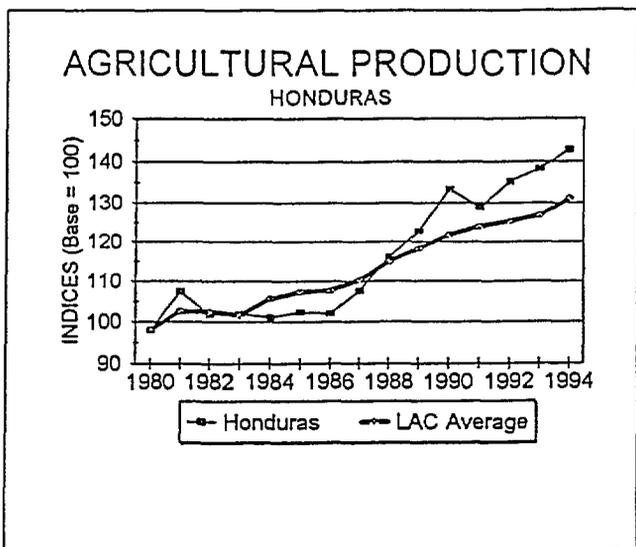
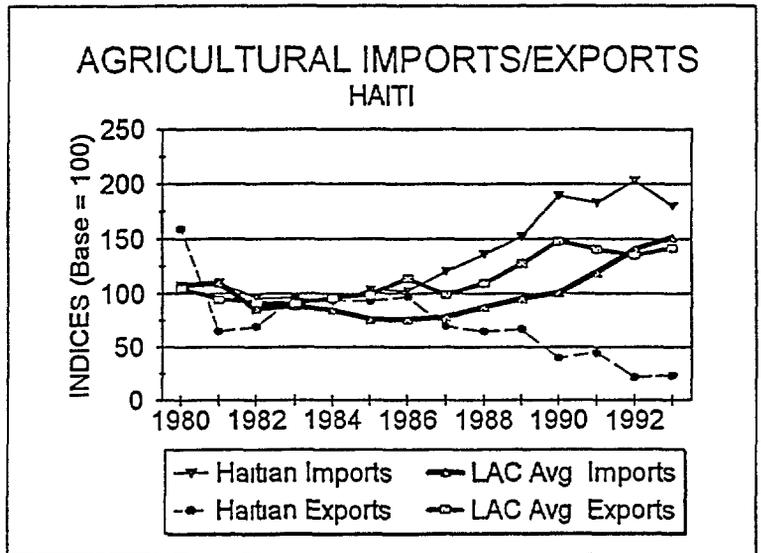
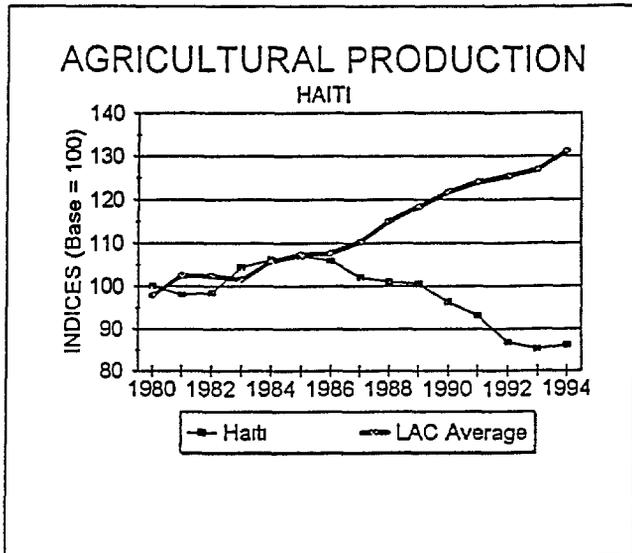
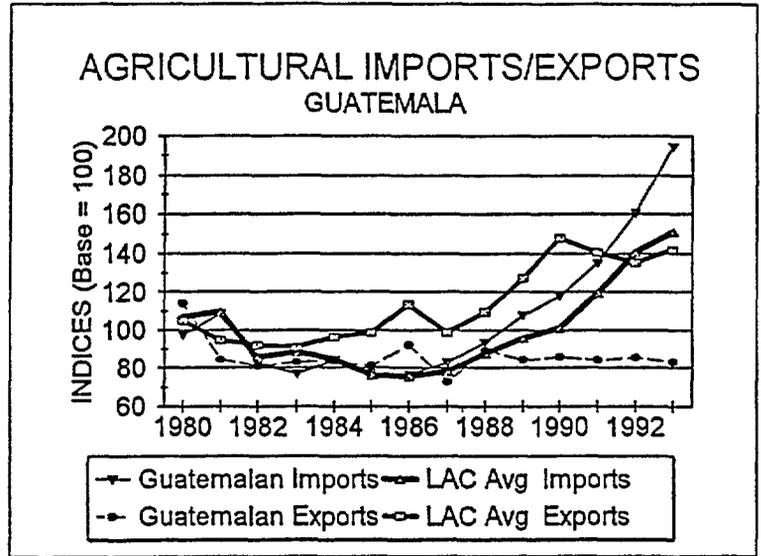
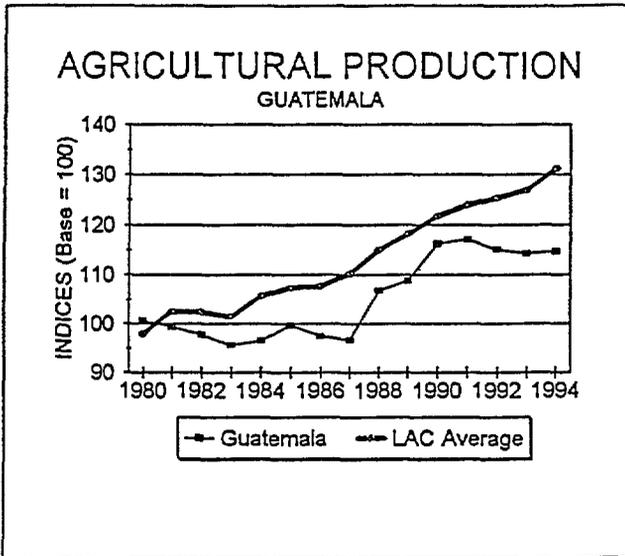


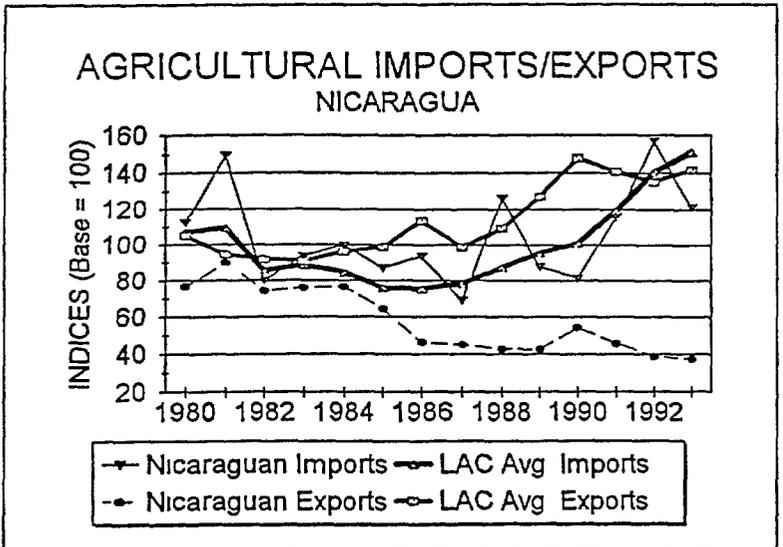
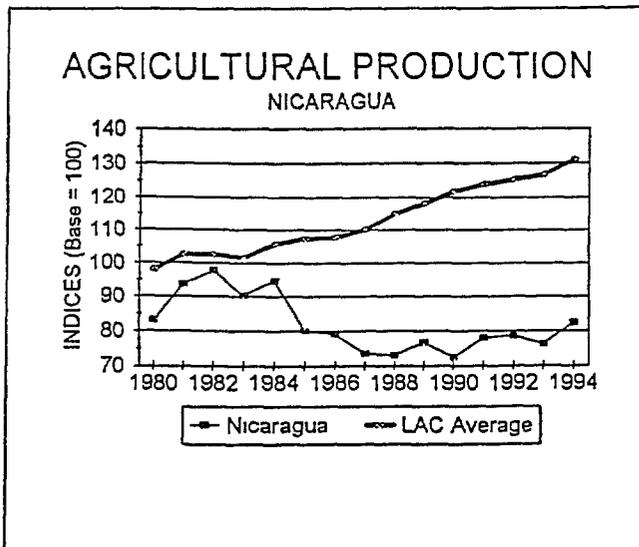
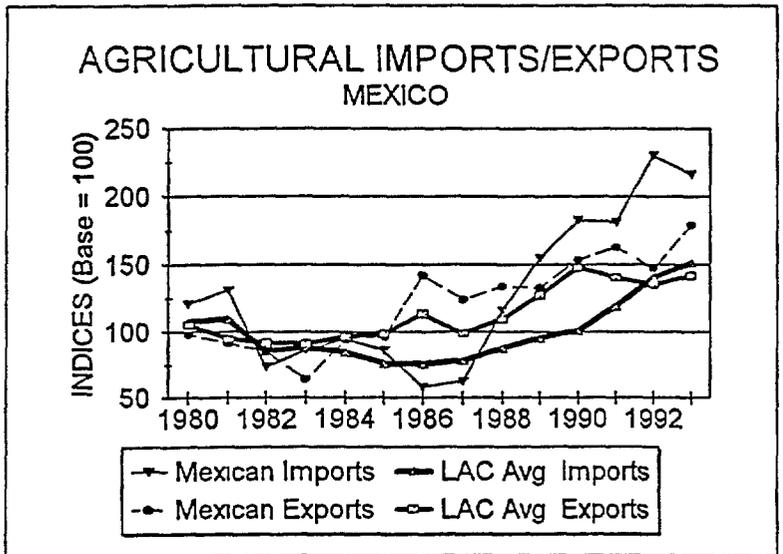
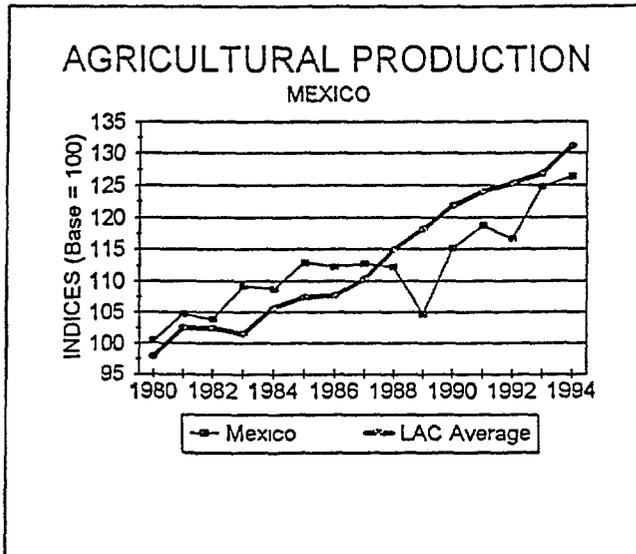
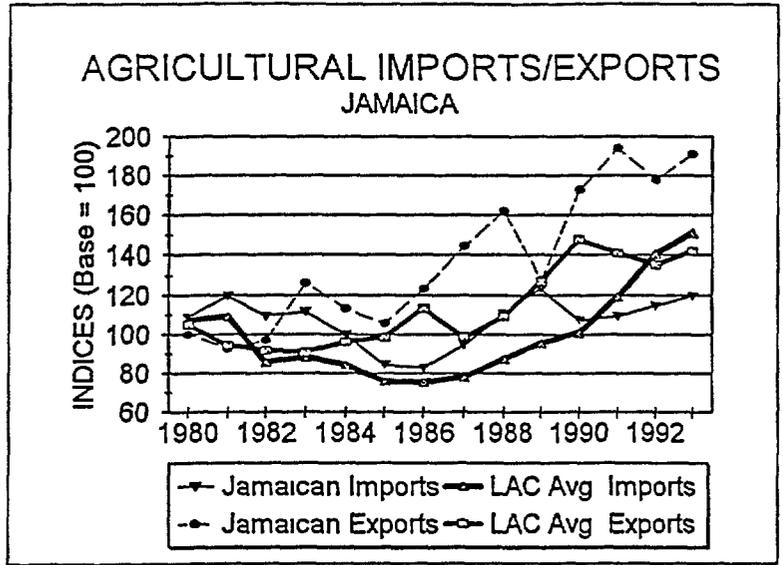
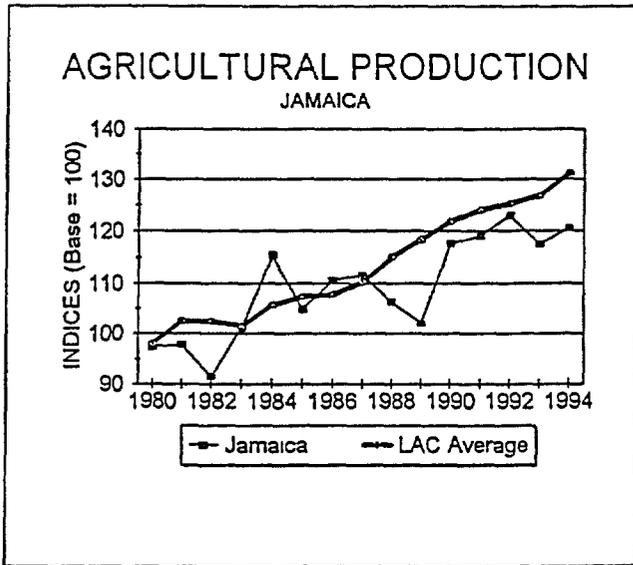
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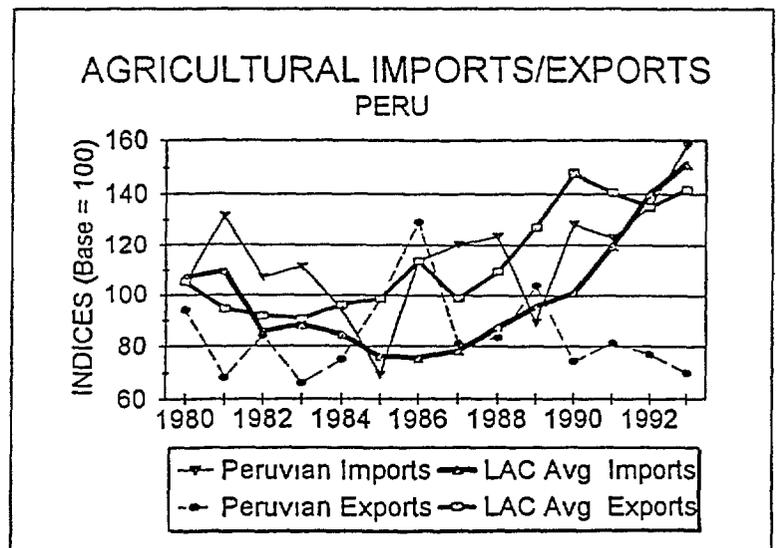
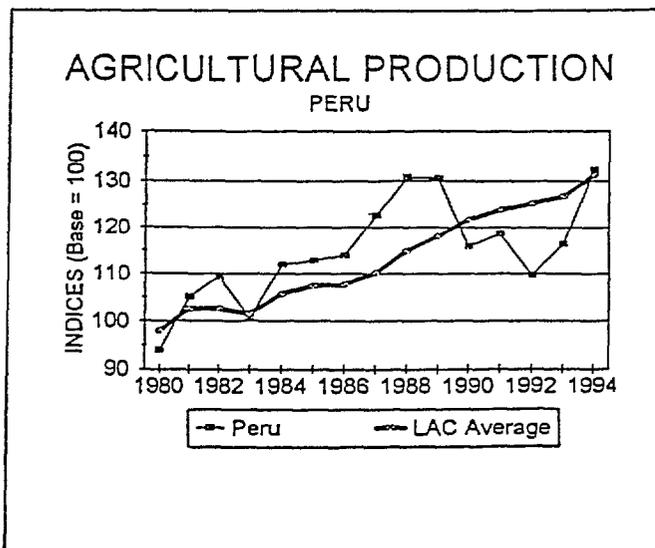
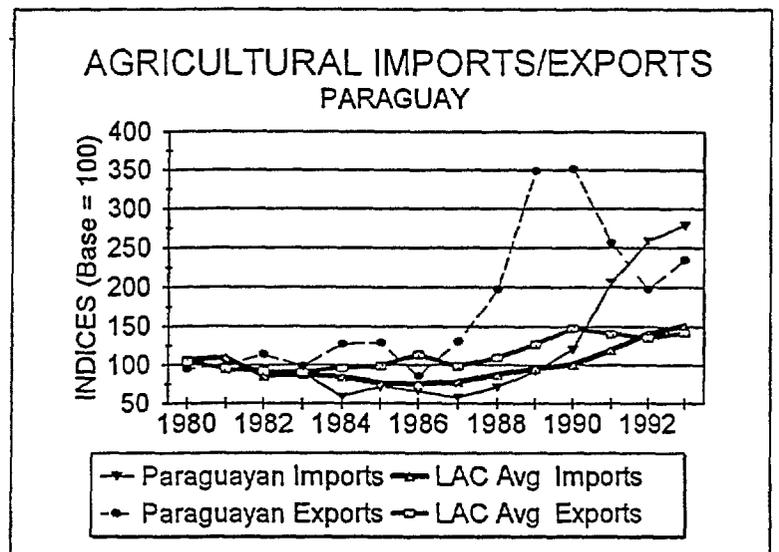
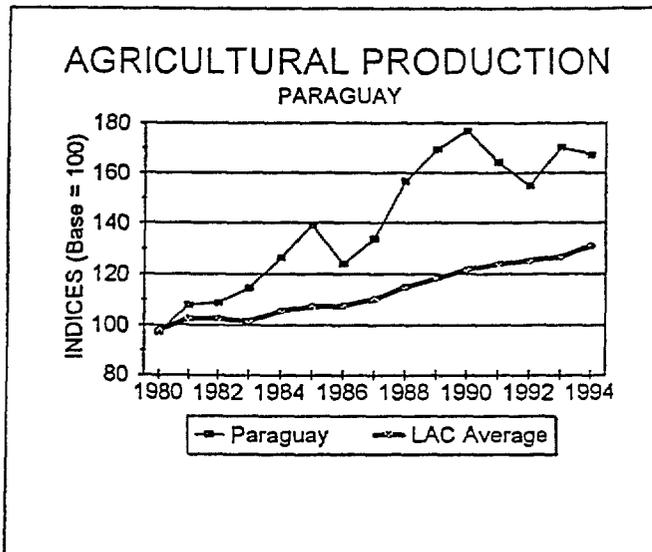
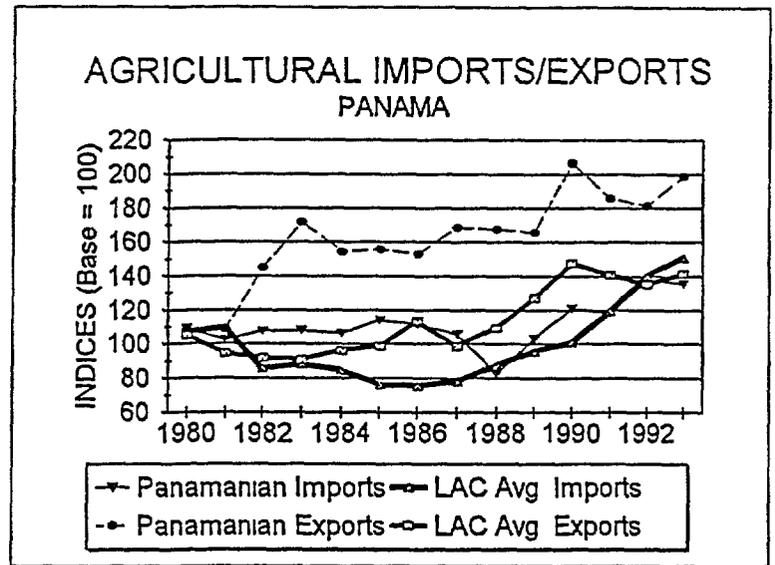
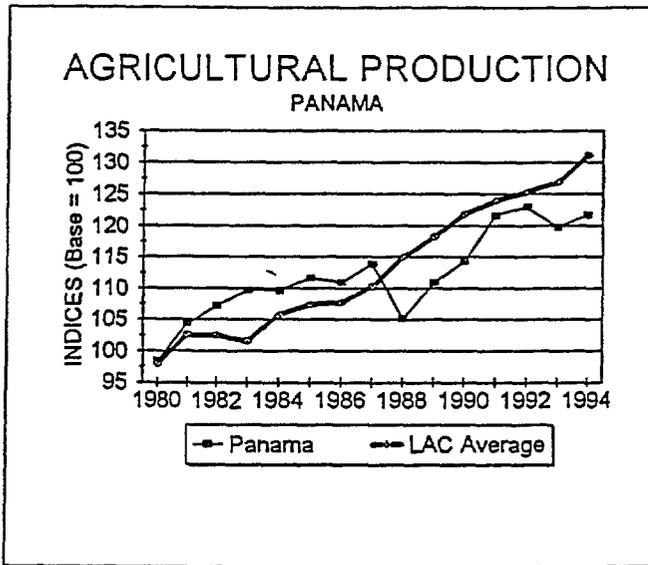






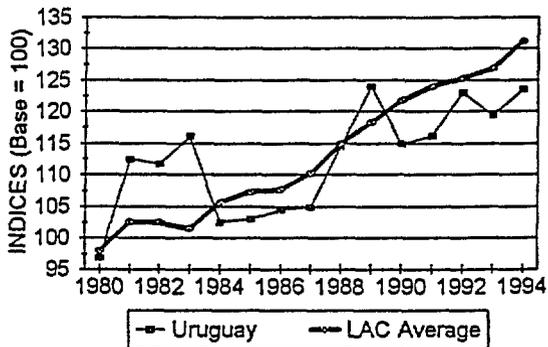




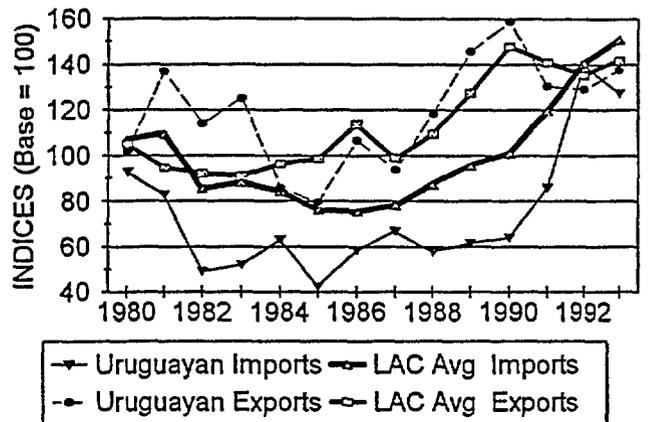


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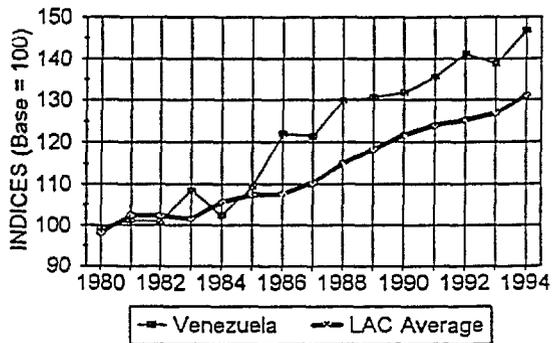
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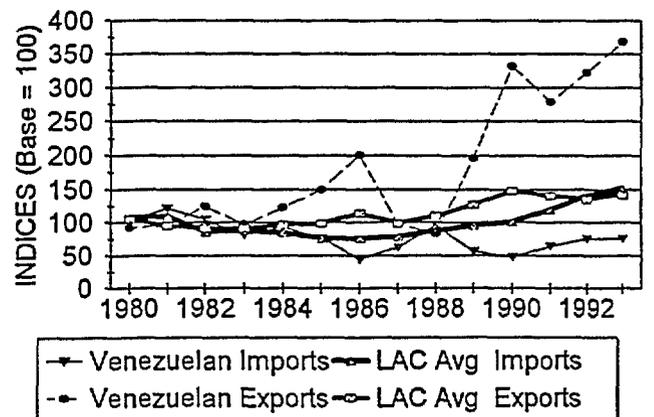
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AGRICULTURAL PRODUCTION VENEZUELA



AGRICULTURAL IMPORTS/EXPORTS VENEZUELA

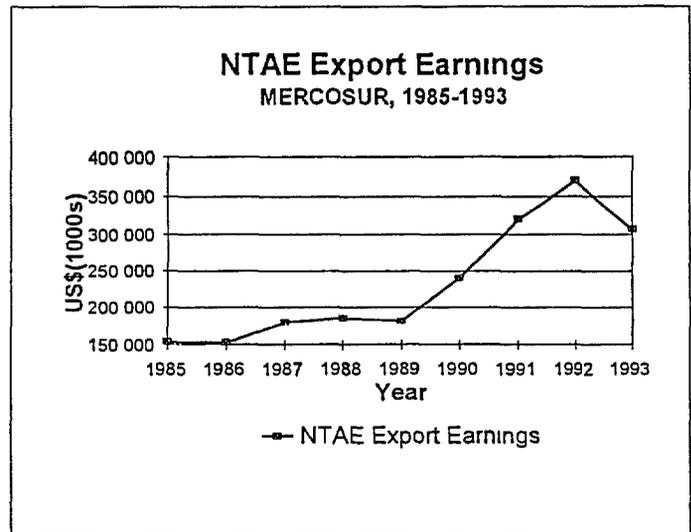
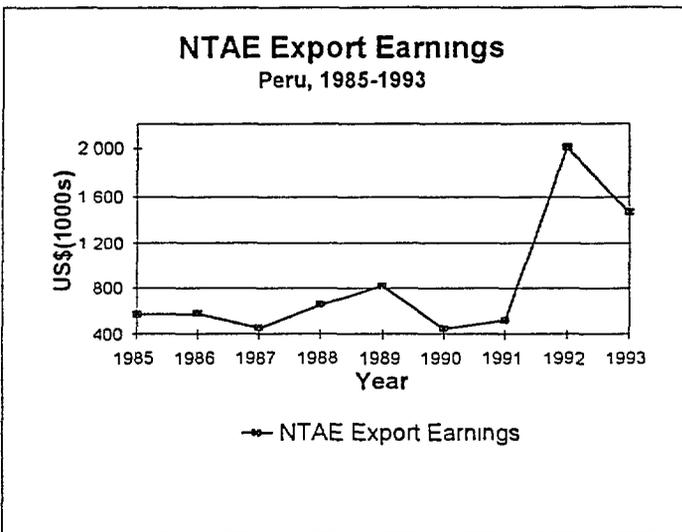
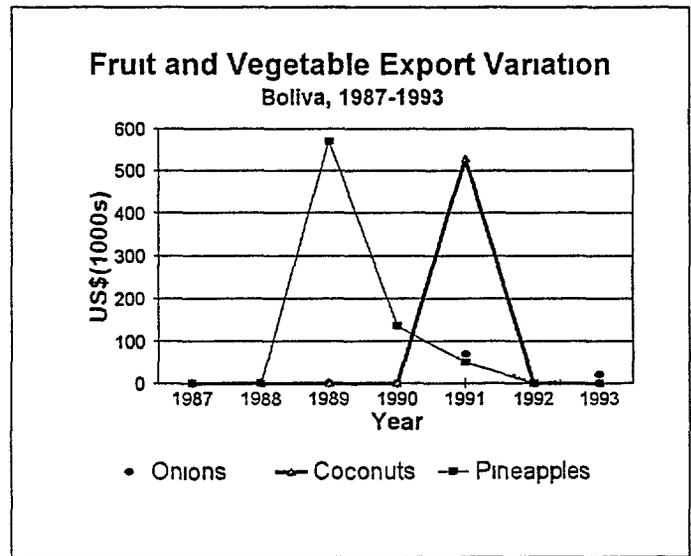
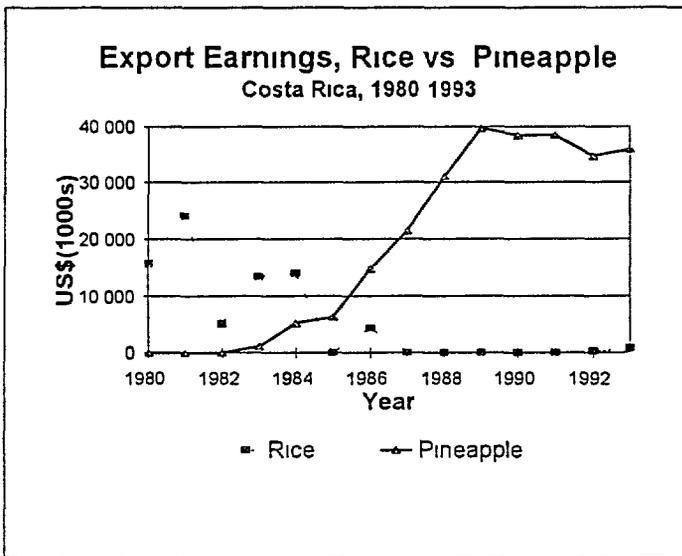


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ANNEX B - Supplement

Dramatic Adjustments and Volatile Production Shifts within NTAE Commodities

Source FAO Agrostat, 1994



ANNEX C - Sub-sector Production Changes in LAC Countries

Notes on graphs

Only countries with population over two million are shown in the graphs of this annex

Members of regional trade groupings are as follows

CACM (Central American Common Market)	Andean Group (also known as GRAN)	MERCOSUR (Southern-Cone Common Market)
Costa Rica	Bolivia	Argentina
El Salvador	Colombia	Brazil
Guatemala	Ecuador	Paraguay
Honduras	Peru	Uruguay
Nicaragua	Venezuela	

The graphs included in this chapter are based on production data taken from the FAO's AGROSTAT Database. The FAO data may differ from those produced by the countries themselves because of differences in definition of production, coverage, weights, time reference of data (the database uses calendar years), and methods of calculation. The following information is paraphrased from the database manuals.

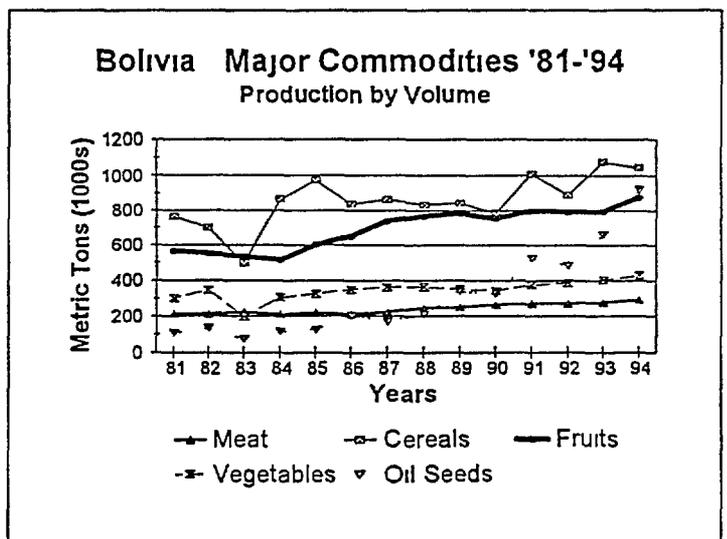
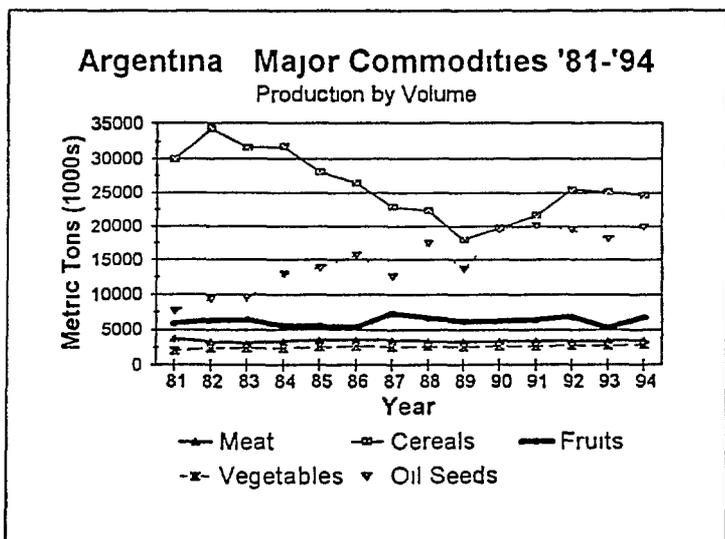
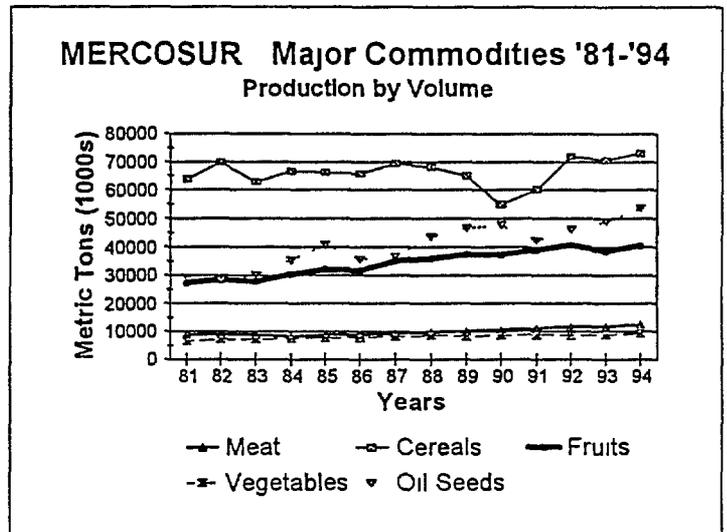
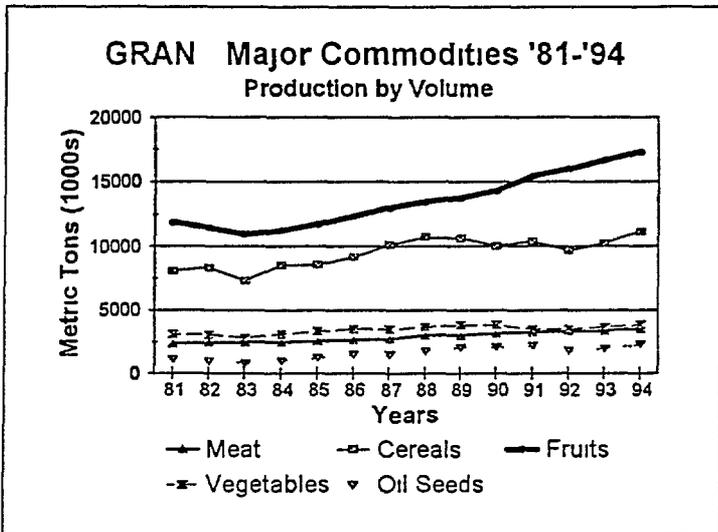
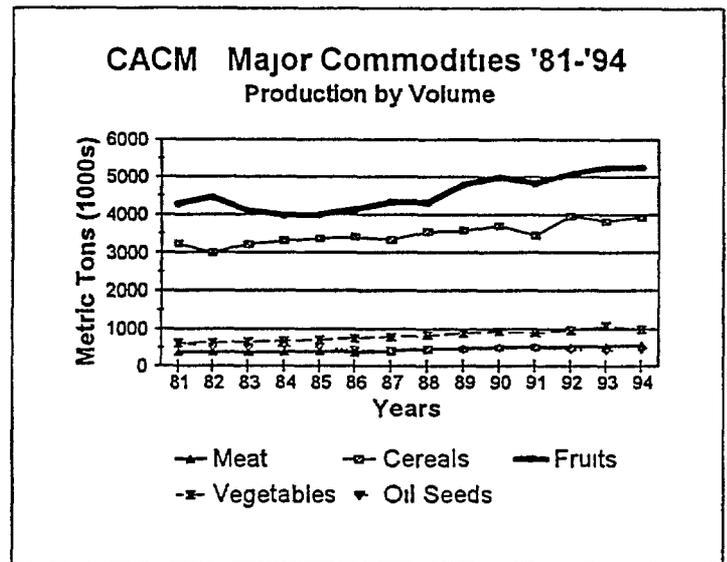
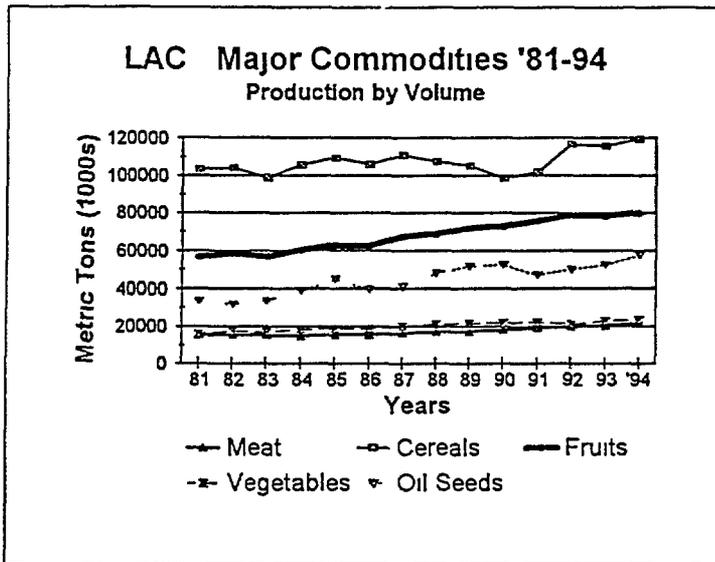
Meat Includes animals slaughtered within national boundaries, irrespective of their origin. The data includes production of meat from all types of domesticated and wild animals.

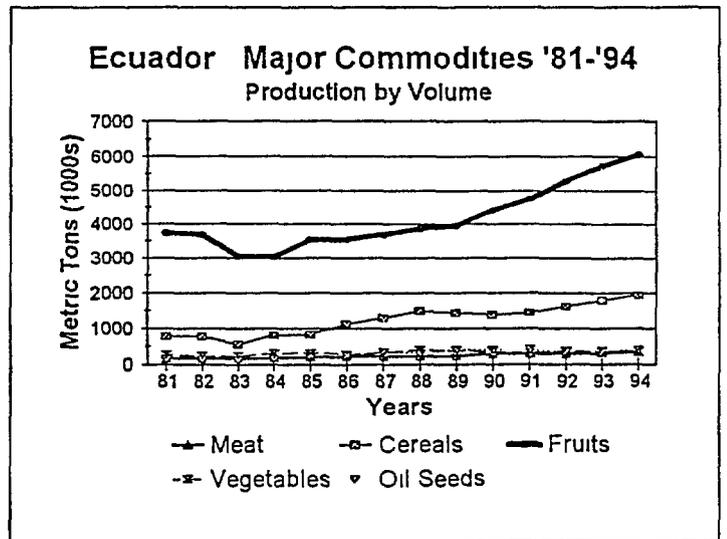
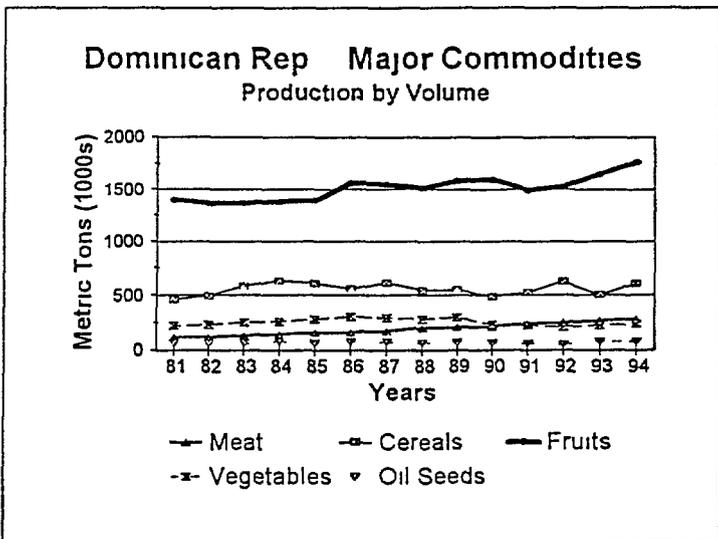
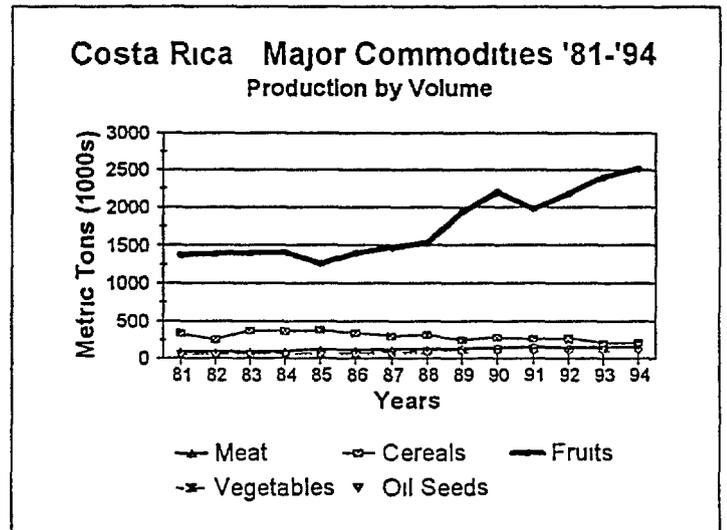
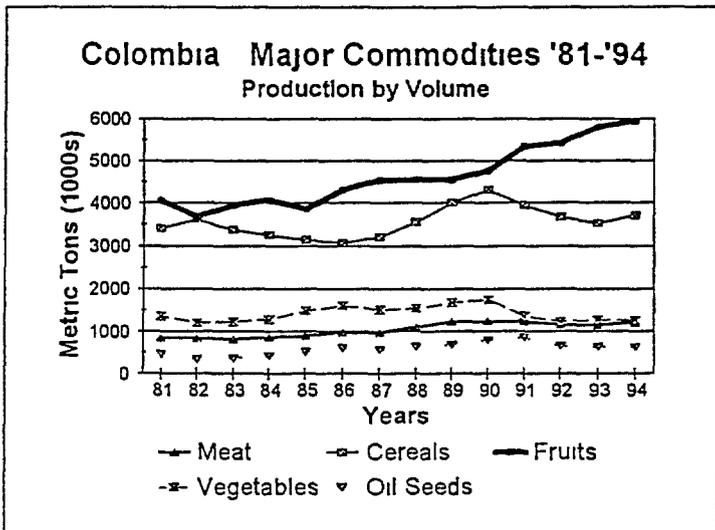
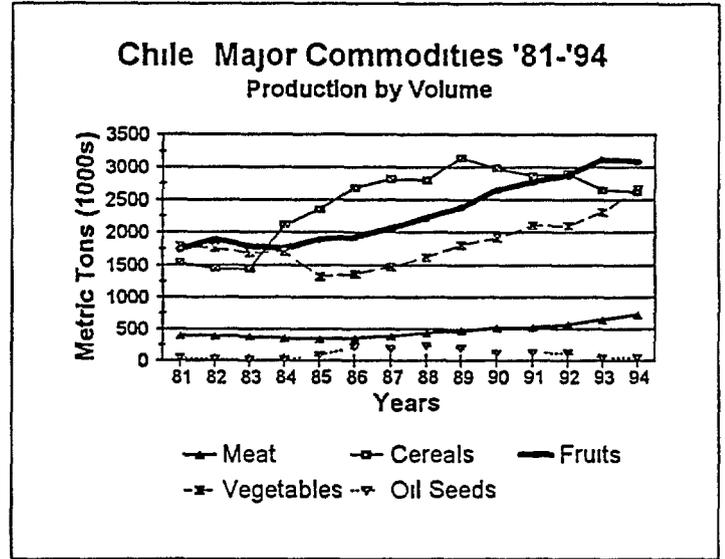
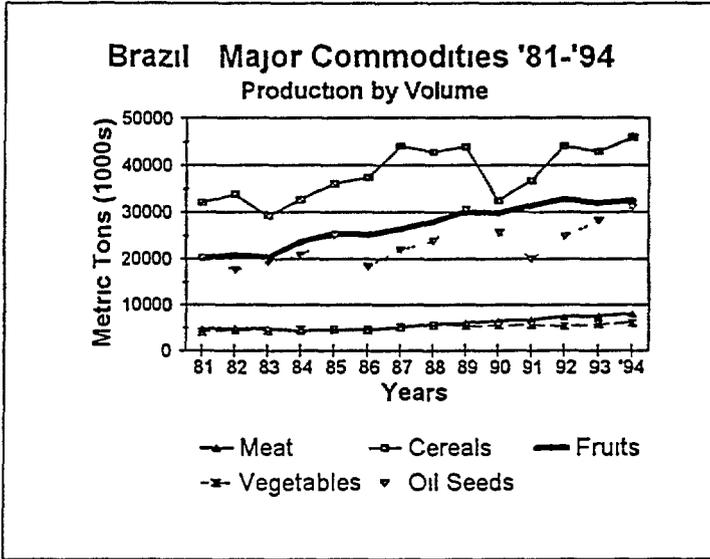
Cereals Includes crops harvested for grain only (wheat, paddy rice, barley, maize, rye, oats, millet, sorghum, popcorn, buckwheat, fonio, triticale, canary seed, mixed grains and cereals). Cereal crops harvested for hay or harvested green for food, feed or silage or used for grazing are excluded.

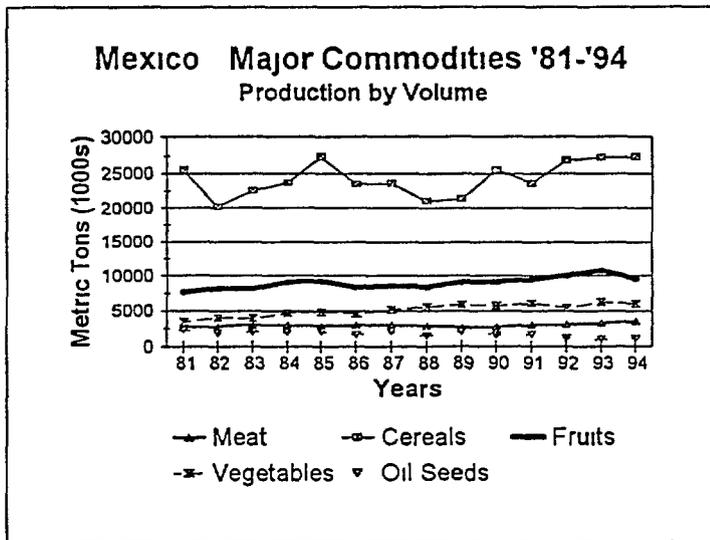
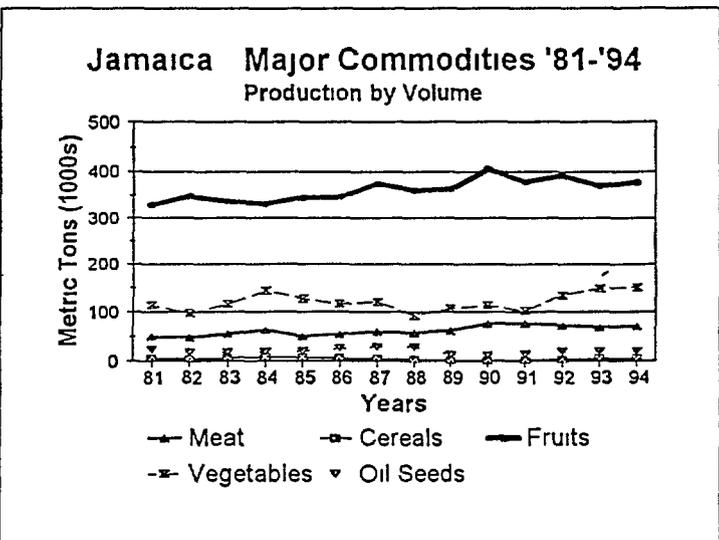
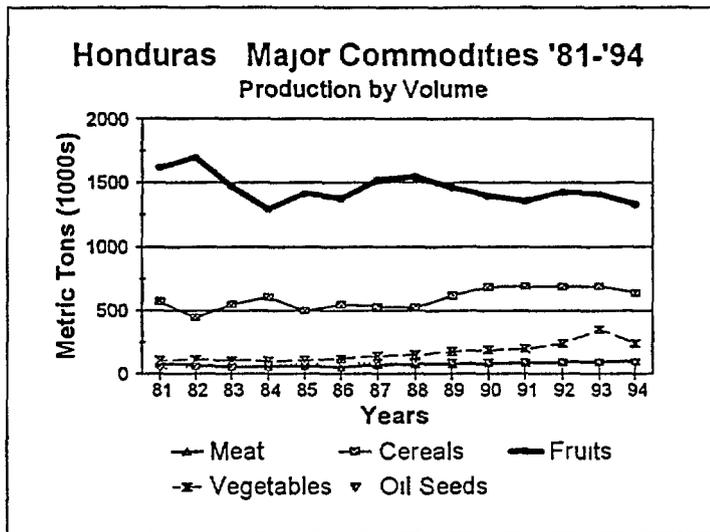
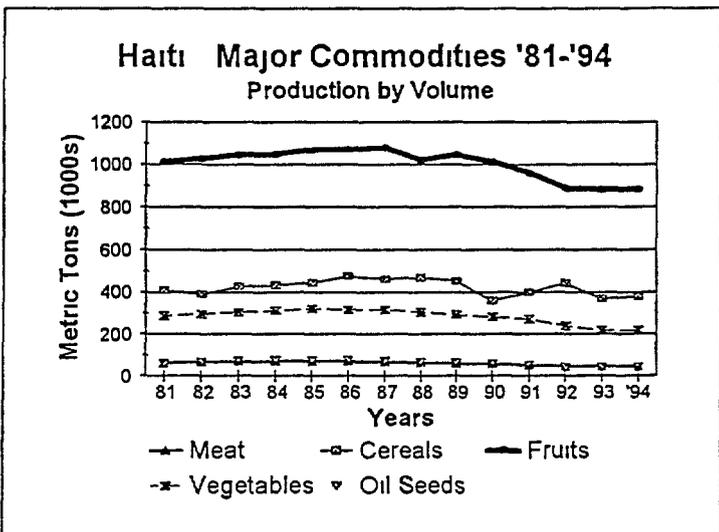
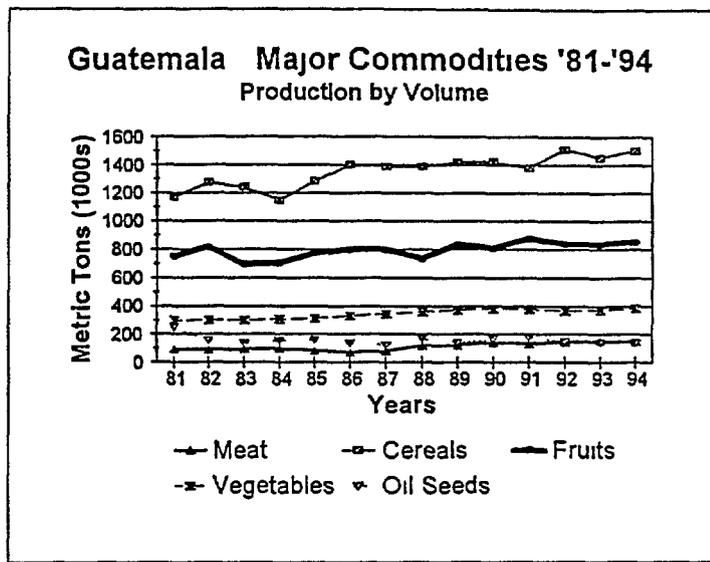
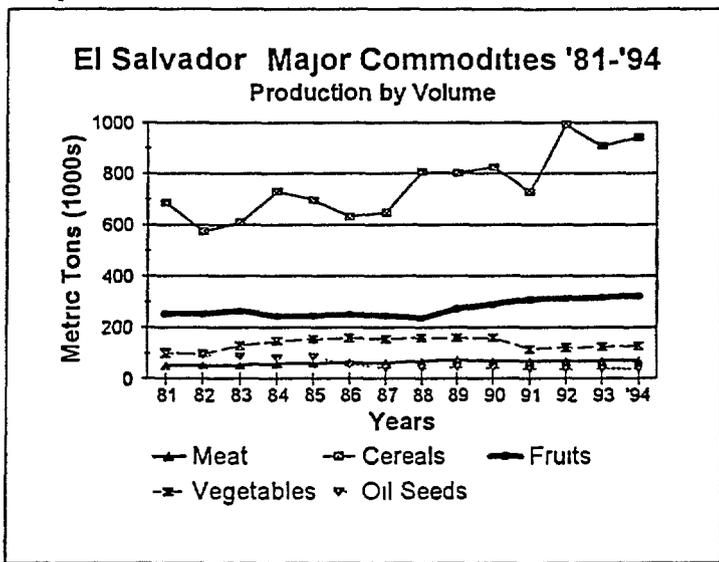
Fruits Includes total production of fresh fruit, whether eventually used for direct consumption for food or feed, or processed into different products such as dry fruit, juice, jam, alcohol, etc. Statistics on fruit, especially tropical fruit, are unavailable in many countries and suffers from lack of uniformity.

Vegetables Includes vegetable crops grown mainly for human consumption as reported by national offices. Crops such as cabbages, pumpkins and carrots are excluded when explicitly cultivated for animal feed. While coverage varies from country to country, estimates generally refer to crops grown in field and market gardens mainly for sale, thus excluding crops cultivated in kitchen gardens or small family gardens mainly for household consumption.

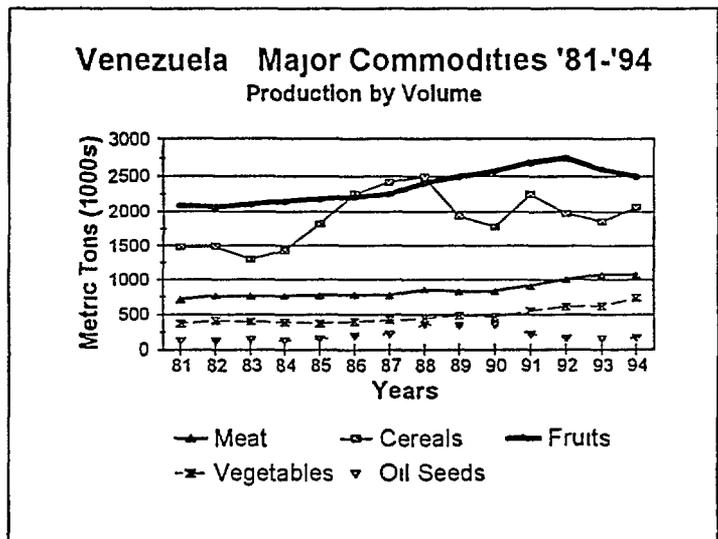
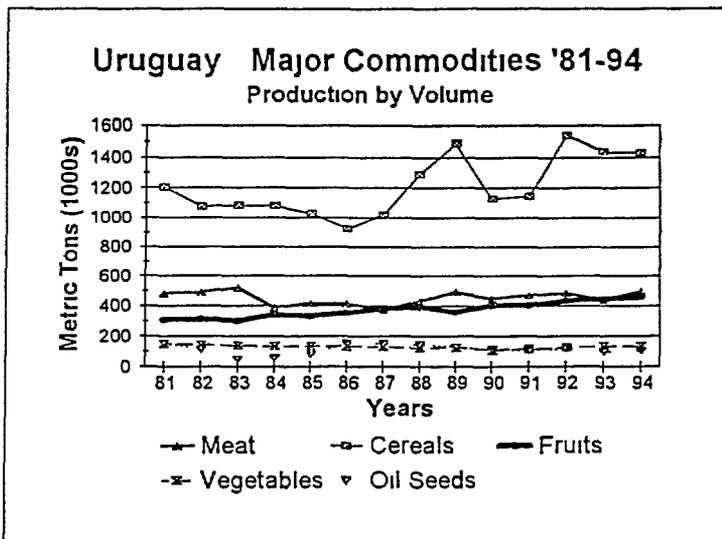
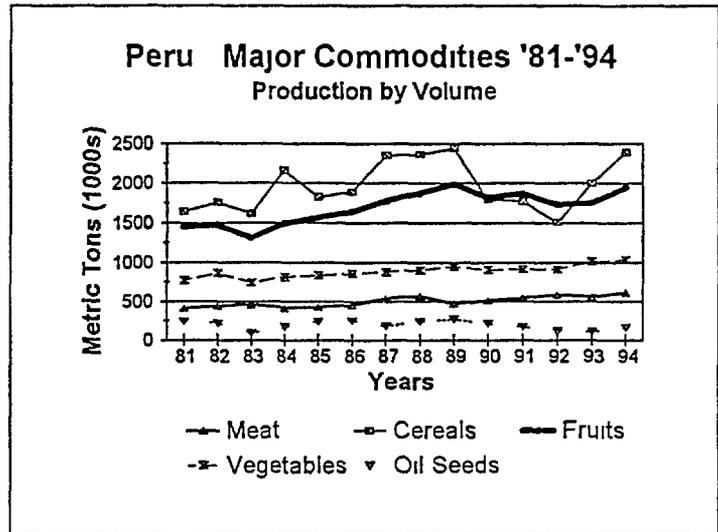
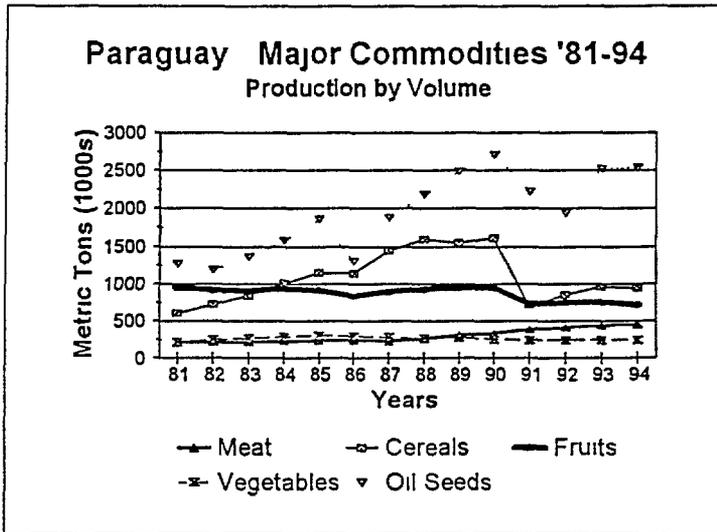
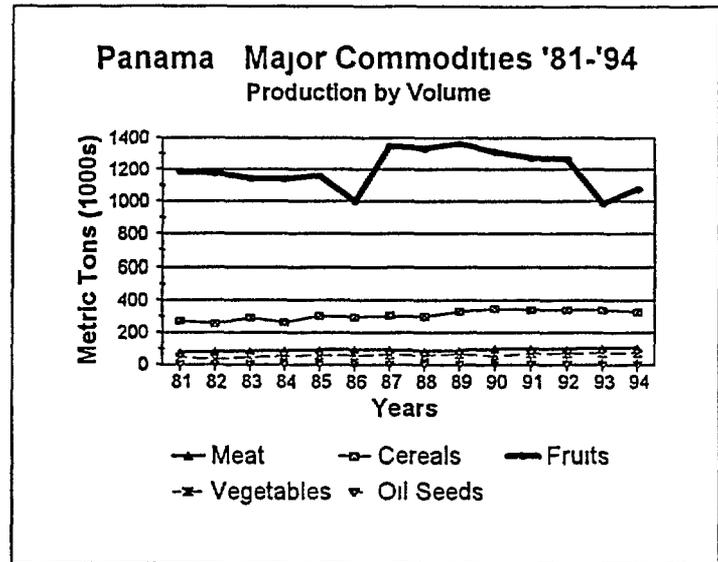
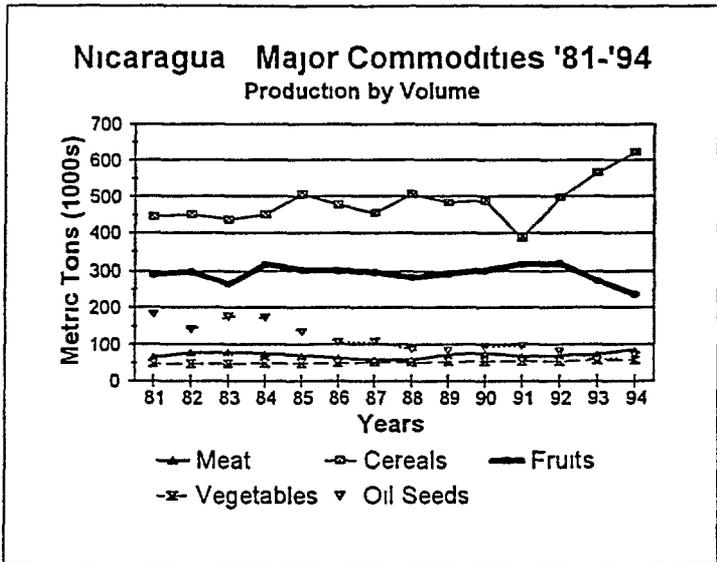
Oil Seeds Includes production data for soybeans, groundnuts, castor beans, sunflowers, rapeseed, sesame seed, linseed, safflower, and cottonseed. The lack of homogeneity of production makes aggregation in product weight meaningless, therefore, the total production in oil and cake equivalent is calculated by applying the average equivalent to each oilcrop.







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ANNEX D - Contact List

LIST OF CONTACTS MADE DURING THE TIAFTA STUDY

International Agricultural Research Centers (IARCS)

Dale Bandy, Coordinator for LAC and Asia, ICRAF
 Christian Bonte-Friedheim, Director General, ISNAR
 Howard Elliott, Deputy Director General, ISNAR
 Pablo Eyzaguirre, ISNAR
 Sam Fuijsaka, Agricultural Anthropologist, CIAT
 Gilberto Gallopin, Leader Land Management Program, CIAT
 Guido Gryseels, Deputy Executive Secretary, Technical Advisory Committee
 Gerardo Habich, Associate Director, CIAT
 Katherine Hart, Financial Officer, CIMMYT
 Robert Havenor, Acting Director General, CIAT
 Emil Q. Javier, Director General, AVRDC
 David Nygaard, Director 2020, IFPRI
 Sherman Robinson, Chief, Trade and Macro Economics Division, IFPRI
 Roger Rowe, Director General, CIMMYT
 Per Pinstrup-Andersen, Director General, IFPRI
 Donald Plucknett, Retired Technical Advisor, CGIAR
 Luis Sanint, Rice Program Leader, CIAT
 Jose Sanz, Tropical Low Lands Program, CIAT
 Richard Sawyer, Former Director General, CIP
 Grant Scobie, Director General, CIAT
 Anne Starks Acosta, Assistant to Director General, CIMMYT
 Joe M. Tohme, Geneticist, CIAT
 Helio Tollini, Director Research Policy Program, ISNAR
 Carlos Valverde, LAC Projects, ISNAR
 Joachin von Braun, Research Fellow, IFPRI
 Alexander von der Osten, Executive Secretary, CGIAR
 Donald Winkelmann, Executive Secretary, Technical Advisory Committee
 Hubert Zandstra, Director General, CIP

World Bank

Yoshaki Abe, Country Department Director
 Andres Abromovich, Senior Agricultural Economist
 Charles Antholt, Senior Agriculturalist
 Jock Anderson, Agricultural Technology Advisor
 Constance Barnard, Chief Natural Resources Management & Rural Poverty
 Michael Baxter, Chief Natural Resources Management & Rural Poverty
 Derek Byerlee, Agricultural Advisor
 Michael Carrol, Agricultural Specialist
 Douglas Forno, Agricultural Technology Advisor
 David Gisselquist, Consultant
 Reed Hertford, Consultant
 Homi Kharas, Lead Economist
 Uma Lele, Advisor, Agricultural Research Group

Nicholas Kraft, Chief Natural Resources Management & Rural Poverty
 Alexander McCalla, Vice President, Agriculture & Natural Resources Department
 Matthew McMahon, Senior Agriculturalist
 Gobind Nankani, Country Department Director
 John Nash, Senior Trade Advisor
 Michel Petit, Director Agricultural Research Group
 Edilberto Segura, Country Department Director
 Alberto Valdes, Agricultural Advisor

Inter-American Institute for Cooperation on Agriculture (IICA)

Carlos Aquino, Director General
 Jorge Ardila, Science and Technology Specialist
 David Black, U S Representative
 Hayden Blades, Executive Director, CARDI
 Roberto Bocchetto, Executive Secretary, PROCISUR
 Harlan Davis, Former Deputy Director General
 Claire Forde, Executive Director, CARDI
 Guillermo Grajales, Regional Coordinator of Planning
 Ruben Guevara, Director General, CATIE
 Roger Guillen Bustos, Coordinating Secretary, CORDECA
 Reed Hertford, Former Deputy Director General
 Cornelia Hugo, El Salvador Representative
 Julio Luna, Coordinator for Interinstitutional Relations
 Robin Marsh, AVRDC Representative
 Reginald Pierre, Special Advisor
 Nelson Rivas, Executive Secretary, PROCIANDINO
 Eduardo Ruben Moscardi Colombian Representative
 Carlos Pomareda, Former Policy Chief
 Ariadne Maria da Silva Chief Technical Cooperation, EMBRAPA
 Jose Schwartzman, Agricultural Research Division, Ministry of Agriculture, Paraguay

Inter-American Development Bank

Maria Asuncion Aguila, Chief, Environment and Natural Resources Management
 Richard Archi, Chief, Country Division 4
 Robert Devlin, Director, Integration, Trade, and Hemispheric Issues
 Ruben Echevarria, Economist, Environment Division
 Ciro de Falco, Manager RE3
 John Hastings, Chief Environment and Natural Resources Management
 John Horton, Agricultural Marketing Specialist
 Miguel Martinez, Manager RE2
 Cressida McKean, USAID Liason Officer
 Walter Ross, Chief Environment and Natural Resources Management
 Silvia Sabario, Executive Director, Central America
 Ricardo Santiago, Manager RE1
 Basilio Souza, Agriculturalist
 Paul Trapido, Agricultural Economist

United States Agency for International Development (USAID)

John Becker, Team Leader, Broad Based Economic Growth, Office of Regional Sustainable Development, LAC Bureau
 Rob Bertram, CGIAR Coordinator, Office of Agriculture and Food Security, Global Bureau
 Dana Dalrymple, Research Advisor, Office of Agriculture and Food Security, Global Bureau
 Don Drga, Broad Based Economic Growth, Office of Regional Sustainability, LAC Bureau
 John Fasullo, Coordinator for Cooperative Development, Bureau for Humanitarian Responses
 Howard, Fitz-Hubert Batson, Consultant, USAID/Barbados
 Elon Gilbert, Consultant to Office of Agriculture and Food Security, Global Bureau
 Harvey Hortik, Chief, Sustainable Technology Division, Office of Agriculture and Food Security
 Julie Mann, Broad Based Economic Growth, Office of Regional Sustainability, LAC Bureau
 Carl Lawhead, LAC TECH Project Officer, Agriculture Enterprises and Marketing Division, Office of Agriculture and Food Security
 John Lewis, Office Director, Agriculture and Food Security, Global Bureau
 Donald McClellan, Agricultural Analyst, CDIE, Bureau for Policy and Program Coordination
 Ron Stryker, Chief, Agriculture Enterprises and Marketing Division, Office of Agriculture and Food Security
 Harry Wing, Office Director, USAID/Lima

United States Department of Agriculture

Cheryl Christiansen, Special Assistant, Under Secretary for Science and Technology
 Andres Delgado, Chief Inter-American and International Programs, International Cooperation and Development
 John Dunmore, Acting Administrator, Economic Research Service
 Frank Fender, Chief, Food Industries Division, International Cooperation and Development
 Patrick O'Brien, Director, Commercial Agriculture Division, Economic Research Service
 Eric Rosenquist, International Program Coordinator, Agriculture Research Service
 August Schumacker, Administrator, Foreign Agriculture Service
 Matthew Shane, Economic Service
 Karl Stauber, Under Secretary for Science and Education
 Howard Steele, IICA Project Manager, International Cooperation and Development
 Constanza Valdes, Senior Economist, Commercial Agriculture Division, Economic Research Service
 Lynette Wagner, International Cooperation and Development, Foreign Agriculture Service

U S Universities**Arizona State University**

Richard Gordon, Professor, Center for Agribusiness Policy Studies
 Al Kagan, Professor, Center for Agribusiness Policy Studies
 Pamela Mischen, Director of the National Food and Agricultural Policy Project
 Eric Thor, Director, School of Agribusiness and Environmental Resources and the Center for Agribusiness Policy Studies
 Pieter van Ispeken, Professor, Center for Agribusiness Policy Studies

Cornell University

David Lee, Agricultural Economist
 Daryl Lund, Dean, College of Agriculture and Life Sciences

Norman Uphoff, Director, Center of International Food and Agricultural Development
Iowa State University
David Acker, Director, International Agriculture Program
Joe Cortez, Seed Center
David Topel, Dean, College of Agriculture
Michigan State University
Fred Poston, Vice Provost and Dean for College of Agriculture
Donald Isleib, Associate Dean and Director of the Institute of International Agriculture
North Carolina State University
Daniel Godfrey, Dean, College of Agriculture and Life Sciences
Oregon State University
James Cornelius, Agriculture Economist
Alan Duetsch, International Plant Protection Center
Hillary Egna, Director Management Entity, Pond Dynamics CRSP
Warren Kronstad, International Wheat Breeder
Stan Miller, Director, Office of International Research and Development
Darryl Richardson, Horticulture Science
Myron Shenk, International Plant Protection Center
Colin Sorhus, Project Coordinator, AGENT
Stanford University
Timothy Josling, Professor, Food Policy Research Institute
Texas A & M University
Edward Hiler, Dean, School of Agriculture
James Goodwin, Coordinator, Office of International Agriculture Programs
University of Arizona
Roger Beattie, Chair, Agricultural Economics
Gary Thompson, Agricultural Economist
Paul Wilson, Agricultural Economist
University of California Berkeley
Kenneth Farrell, Former Vice President, Agriculture and Natural Resources Program
Jim Zion, Professor, Department of Agriculture
University of California Davis
Roberta Cook, Agricultural Economics Extension
Lovell Jarvis, Department of Agricultural Economics
Barbara Schneeman, Dean, College of Agricultural and Environmental Sciences
University of Florida
Peter Hartmann, Office of Vice President for Agriculture and Natural Resources
University of Georgia
Harlan Davis, Associate Vice President, International Development
William Hargrove, Director Management Entity, SANREM CRSP
University of Idaho
Harvey Neese, Director, Post Harvest Institute for Perishables
Judy Edminister, Post Harvest Technician, Post Harvest Institute for Perishables
University of Illinois
David Chicoine, Dean College of Agricultural, Consumer, and Environmental Sciences
Thomas McCowen, Associate Director, Office of International Programs
University of Minnesota
Mike Martin, Dean, College of Agricultural, Food, and Environmental Sciences

Terry Roe, Director, International Agricultural Trade Research Consortium
 Vernon W Ruttan, Professor, Department of Applied Economics
 G Edward Schuh, Dean, Hubert H Humphrey Institute of Public Affairs
 University of Missouri
 Fred Mann, International Agriculture Programs
 Washington State University
 Sally Burkland, Coordinator, Latin American
 Working Group, Office of International Programs
 Scott Cameron, Plant Breeder, Vancouver Station
 James Carlsen, Associate Dean, College of Agriculture and Home Economics
 Ralph Cavaleri, Chair, Biological Systems Engineering
 James Hensen, Director, Office of International Programs
 Thomas Lumpkin, Professor, East Asian Agriculture
 James McCollough, Director, International Business Program
 Nila Medina, Business and Marketing Department
 Jan Noel, Director, Development Cooperation, Office of International Programs,
 James Zuiches, Dean, College of Agriculture and Home Economics

Agribusiness

Roger Baccigaluppi, Former President, Blue Diamond, Sacramento, CA
 John Balis, Agribusiness Coordinator, Citizens Network
 Wayne Boutwell, President, National Council of Farmer Cooperatives
 John Costello, President and CEO, Citizens Network
 Perry Dixon, Archer Daniels Company
 Everette Gordon, Otis McAllister, Inc San Francisco, CA
 Richard Gady, ConAgra, Inc
 Eric Hurlburt, Director, Export Promotion, State of Washington, Olympia, WA
 Robbin Johnson, Cargill, Inc
 Dean Kleckner, President, American Farm Bureau Federation
 Larry Liebenow, Chairman, Western Hemisphere Task Force, U S Chamber of Commerce
 James Sedlacek, Consultant, Appleton, WI
 J B Smith, Former Vice President, Dole
 Chuck Smutney, S&W Foods-a Tri Valley Coop, San Francisco, CA
 Nancy Tucker, Vice President International Trade, Produce Marketing Association
 Tom Urban, Chairman and CEO, Pioneer Hi-Bred International
 Clayton Yeutter, Hogan & Hartson

Private Voluntary Organizations and Think Tanks

Robert Blake, Chairman, Committee for Agricultural Sustainability, World Resources
 Institute
 Nick Dehejia, World Resources Institute
 Tom Fox, President, World Resources Institute
 Virginia Hammond, National Association of State Universities and Land Grant Colleges
 Dale Hathaway, Director, National Center for Food and Agricultural Policy
 Richard Herrett, Executive Director, Agricultural Research Institute
 Paula Lashober, President, Washington State/Chile Partners of the Americas
 Jorge Litvack, President, International University Exchange
 Susan Offutt, Board on Agriculture, National Academy of Science
 Don Reeves, Economic Policy Analyst, Bread for the World

Peter Shiras, Director Legislative Affairs, Interaction
 Robert Thompson, President, Winrock International
 Ann Thrupp, Director of Sustainable Agriculture, World Resources Institute

U S Foundations

Larry Armstrong, Deputy Executive Director, Pan American Development Foundation
 Walt Coward, The Ford Foundation
 Norman Collings, The Ford Foundation, Mexico
 Robert Herdt, The Rockefeller Foundation
 Russel Mawby, President WK Kellog Foundation
 Russel Reoding, Director of Programs, Pan American Development Foundation
 Julie Sutphen Wechsler, Regional Director, Inter-American Foundation
 Vice President for Programs, Inter-American Foundation

Latin American Institutions

Argentina

Martin Pineiro, Director, Grupo CEO, Buenos Aires
 Eduardo Trigo, Director Ejecutivo, Buenos Aires

Chile

Eduardo Venezian Leigh, Decano de Agronomia, Pontifica Universidad Catolica de Chile

Colombia

Carlos Gavilanes Caicedo, Director Ejecutivo, Sanafe de Bogota

Ecuador

Jorge Francisco Chang Gomez, Director Ejecutivo, FUNDAGRO, Quito

Honduras

Medardo Galindo, Federacion de Agroexportadores de Honduras
 Richard Knab, Asistente del Director, Zamorano
 Adolfo Martinez Rondanelli, Director, FHIA, La Lima
 Eugene Ostmark, Director de Investigacion, San Pedro Sula
 Mario Pfaeffle, Lider de Mercadeo, Fundacion Hondurena de Investigacion
 Jesus Sanchez, Lider do Cacao, Fundacion Hondurena de Investigacion

Jamaica

Stephen Wade, Small Business Export Development Project, Kingston
 George Wilson, Farm Director, Jamaica Agriculture Research Program, Kingston

International Organizations

Issac Cohen, Representative, UN Economic Commission for Latin America and The Caribbean
 Jose Luis Cordeau, FAO Regional Office, Santiago, Chile
 Juan Jose Echevaria, Economic Counselor, Organization of American States
 A Kasseba, Director, Technical Advisory Division, International Fund for Agricultural Development
 R J Perkins, Director, Commodities and Trade Division, FAO, Rome, Italy
 Chuck Riemenschneider, Representative, FAO, Washington D C
 H E Ryan, Senior Economist, Commodity and Trade Division, FAO, Rome, Italy