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**A Dynamic Comparative Advantage Analysis
of Fresh Fruit and Vegetable Trade
Between Latin America and the United States**

Laurance Prescott, Gordon Rausser, and Mary Beth Sigler

Executive Summary:
An Empirical Investigation into the Trade and Investment Effects
of a Southern Hemisphere Free Trade Agreement

Jeremy Arnone and Gordon Rausser

GATT Paper 96-GATT 1
May 1997

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OF FRESH FRUIT AND VEGETABLE TRADE
BETWEEN LATIN AMERICA AND THE UNITED STATES**

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of a Southern Hemisphere Free Trade Agreement***

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*This Executive Summary encompasses two additional papers: "Agriculture Trade Liberalization and Capital Flows in the Americas" (96-GATT 2) and "Institutional Rules and Mechanisms for Western Hemisphere Trade" (96-GATT 3).

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**EXECUTIVE SUMMARY: AN EMPIRICAL INVESTIGATION
INTO THE TRADE AND INVESTMENT EFFECTS
OF A SOUTHRN HEMISPHERE FREE TRADE AGREEMENT**

The year 1994 saw the ratification of the North American Free Trade Agreement (NAFTA), a trade agreement between the United States and Mexico which calls for the gradual phasing out of numerous government-erected barriers to trade (essentially in fresh fruits and vegetables), including both tariff and nontariff restraints. Proponents of the legislation contend that with the elimination of artificial inefficiencies NAFTA will result in increased production, the efficient allocation of resources, increased investment, and decreased prices for the consumer. Concurrently, some have argued that including additional Latin American countries in NAFTA or a similar free trade arrangement will result in even greater economic efficiencies and benefits.

The plausibility of increased trade is further buttressed by the recent changes occurring within the U.S. fresh fruit and vegetable market relative to both U.S. and Latin American productive capacity. Indeed, between 1970 and 1992, domestic per capita consumption of fresh fruit increased from 79.2 to 98.8 pounds, while the fresh vegetable market witnessed a corresponding increase from 110.6 to 133.4 pounds. At the same time, domestic supply remained relatively static, with technologically-based efficiencies at least partially offset by decreasing acreage under cultivation. As a result, while fresh fruit and vegetable imports accounted for 18 percent of domestic consumption in 1973, this had increased to 24 percent by 1992. When the relevant market is limited to fresh fruit, the increase was even more dramatic, rising from 28 percent in 1973 to 39 percent in 1992. Further, demographic and other changes strongly suggest a rising domestic demand in the foreseeable future.

With these aggregate economic considerations as background, this paper addresses the opportunity to establish new rules and mechanisms to promote freer trade and investment in the Americas, and the likely effect of taking such a move. Many Latin American countries have taken and continue to take great strides in changing and establishing the infrastructure and the rules and mechanisms, both private and public, needed to take advantage of the opportunity.

This paper further addresses the likely production, investment, and price repercussions of using NAFTA or a similar free trade agreement to include the United States and selected Southern hemisphere neighbors in a regional free trade zone. Specifically, we examine the assumption that increasing the number of participants in a Southern hemispheric free trade agreement may portend lower prices, a surge

of production in relevant Latin American countries, and a corresponding flow of investment to these countries as international investors realize the profit potential inherent within agreements predicated on pure comparative advantage. To further establish a preliminary estimate of the effects of extending NAFTA (or an equivalent agreement) to various Southern hemisphere countries, we will detail the effects of the 1983 Caribbean Basin Initiative on prices, production, and investment flows. Using the empirical results of this factual example, we gauge the reliability of our study's findings.

Because of the sheer volume of products that are currently traded between numerous Latin American countries and the United States, selection criteria were used to segregate specific products and countries. Although it is arguable whether some products or countries should have been included, the intent was to include a diverse selection of product-country associations. Some established product-country combinations are supplemented by combinations which possess substantial growth potential over the foreseeable future. Further, we mainly chose products for which there existed a substantial period when U.S. domestic supply alone was unable to fill domestic demand.

Six countries were selected for the study: Argentina, Chile, Colombia, Guatemala, Honduras, and Mexico. Selection criteria included: (1) the availability of sufficient data; (2) the production of particular products; (3) the country's political system; (4) the country's economic and agricultural policies; (5) the country's infrastructure; (6) the country's marketing strategies and abilities; (7) the country's natural resources and climate; (8) the government's commitment to technological advances and growth in human capital stocks; and (9) an overall measure of the country's comparative advantage vis-à-vis the United States.

Clearly these countries run the gamut of socioeconomic and political development, with strong attributes in one field potentially offset by deficiencies in another. To develop an overall description of a particular country's current and future export strength, we weight each criterion to develop a readiness-for-export index. This index provides a reasonable and consistent basis upon which to predicate country selection. However, the constraint imposed by insufficient or nonexistent data renders this study less than ideally complete. Furthermore, the most significant effects of a hemisphere-wide free trade agreement might occur in countries that currently do not export any quantity of a particular good to the United States. Hence, it is very difficult to reliably estimate the effects of decreased trade barriers on a particular country's decision to *initiate* exporting a particular product to the United States.

Several products were selected for the study, including asparagus, bell peppers, cantaloupes, cucumbers, grapes, oranges, strawberries, and tomatoes. Selection criteria included: 1) the product's

price-to-weight ratio; 2) U.S. shipments; 3) the magnitude of current imports; and 4) the per capita growth in U.S. consumption over specified time periods. Similar to the country selection process already mentioned, we chose products based on both their current exportability and their future potential for export growth. Among the most attractive were those products for which future technological growth in Latin American countries might drastically alter the current competitive situation by providing these countries technologically-based lower costs in addition to their current labor-cost advantages.

One of the key determinants affecting any such study is measuring the time period each year when domestic production does not compete with Latin American production. We calculate this *window of opportunity* for each country-product combination. For some products, such as asparagus and cantaloupes, significant periods exist for which there is no domestic production. By assuming identical demand curves for domestic and Latin American products regardless of the time period, our analysis indicates substantial export potential for these products based on the current comparative advantage.

At the same time, products such as bell peppers and oranges currently have little or no window of opportunity. However, these products are included in the current study under the assumption that relaxed trade barriers could substantially increase their export potential based on lower Latin American prices.

Our examination of the existing literature and data leads us to several conclusions. Before identifying and briefly discussing these results, it is important to note, that the omission of countries which do not currently export particular products to the U.S. market may significantly understate the expected gains from free trade. It is possible that the elimination of trade barriers would provide sufficient incentive for such countries to commit resources to large-scale exportation. However, without adequate information to assess this potential, our study assumes no entry from these countries, an unlikely situation which leads to a systemic underestimation of price, production, and investment effects.

With this caveat in mind, we draw several conclusions from the current study. First, we conclude that there would be very modest price and quantity effects associated with extending NAFTA or a similar free trade agreement to the countries in question, with several exceptions briefly discussed below. Contrary to commentators and researchers who, a priori, insist on the substantial benefits of expanding free trade to Southern hemisphere countries, our study indicates that there will not be large-scale shifts of output to the U.S. market for a majority of the products studied based on current comparative advantages. Additionally, we predict relatively inconsequential price effects for consumers, with slightly higher other-market and Latin American market prices generally offset by trivially lower cross-product average prices for the U.S. consumer.

We estimate price effects using two values for the elasticity of substitution: 4.00, for a low-range estimate, and 20.00 for an upper-bound (and more realistic) estimate. Additionally, we model both the short-run and long-run effects on prices and quantities. With a substitution elasticity of 4.00, the volume-weighted short-run price effect for many of the products is less than 1 percent. When the more probable elasticity-of-substitution value of 20.00 is used, realized export prices increase, but still remain somewhat unexpectedly trivial. When the long-run price effects are examined similar results occur. Finally, the actual dollar-per-pound export price increase is typically less than half a penny.

An examination indicates relatively modest quantity effects under a systematic and inclusive free trade agreement, with a large percentage of increased imports due to other-market shifting rather than an increase in production. For example, we predict Mexican asparagus imports would increase by approximately 51 million pounds in the short run (substitution elasticity of 20.00). However, less than half of these higher exports would be the result of increased Mexican production. We predict that underlying macroeconomic conditions will result in intermarket production shifts rather than strictly higher production.

Finally, and perhaps most importantly, our study finds that investment opportunities will be substantially less than predicted by free trade proponents. If a dollar increase in output yields a \$.46 increase in investment, and assuming a free trade agreement incorporating all countries and products examined in this study, investment will increase by between \$38 million to \$89 million in the short run, a relatively insubstantial amount.¹ Even in the long run, we estimate that investment will increase by only \$47 million to \$133 million.

There are several empirical rationales for these conclusions. First, for some product-country combinations, duties and tariffs have already been substantially or wholly eliminated, either through the Caribbean Basin Economic Recovery Act or the Andean Trade Preference Act. A large percentage of the product-country combinations have realized import duty rates of close to 0 percent. *Ceteris paribus*, for these combinations current quantities and prices already closely approximate the free trade equivalents. Without additional macroeconomic or microeconomic changes (such as technological advances or changes in preferences and demographics), many of the studied countries have little incentive to increase imports and/or domestic production based on the reduction or elimination of the already innocuous trade restrictions currently applied.

A second explanation for the relatively insubstantial trade and investment effects is the relatively small proportion of the total percentage of Latin American production allocated to the U.S. market. For

example, between 1989 and 1992, only U.S. exports of asparagus and cucumbers accounted for more than 25 percent of total production by the studied countries, with a volume-weighted average of only 7.24 percent.² Because of the high substitutability between products regardless of production location (i.e., consumers are relatively indifferent to a choice between U.S. or Mexican tomatoes), and the resultant high substitution elasticities, Latin American producers are more likely to shift other-market exports to the U.S. market than to invest in new facilities capable of increasing aggregate production.

There are several exceptions to these findings: Mexican production of asparagus, cantaloupes, and cucumbers; Colombian asparagus; and Chilean asparagus. Our analysis indicates several reasons for this. First, relatively substantial duties exist for these particular products when exported by Mexico, Chile, and Colombia. Second, as a percentage of their total domestic production, these countries export a large percentage of these products to the U.S. market. This high ratio decreases the possibility of satiating higher expected U.S. demand with other-market exports.

As the results of this study indicate, the forecast of widespread and evenly distributed benefits to countries based simply on their inclusion in an agreement which obviates trade barriers is fallacious. It presents an overly simplistic view of free trade and comparative advantage. Nevertheless, the examination of several key interactions facilitates the prediction of free trade's likely effects. First, the presence and magnitude of existing trade barriers must be determined. If, as in this study, tariff and nontariff barriers are already trivial, the complete elimination of already-reduced impediments is likely to produce only limited trade increases. Second, consideration must be given to the amount of exports allocated to a particular market as a percentage of total domestic production. When this ratio is small, it is likely that the producer will shift exports between markets rather than increase production. As the Mexican example indicates, a larger ratio of exports to total production will increasingly lead to the augmentation of productive capacity. Of course, as the particular product's elasticity of substitution decreases, the exporter will be more likely to increase production than to shift current production. Third, careful examination must be made of the product's window of opportunity. If current demand is generally filled by the producers within the importing country, the plausibility of large-scale imports is correspondingly decreased. Finally, it is important to remember that the total benefits that result when numerous countries are included in a free trade agreement are likely to be substantially less than the sum of the benefits that might accrue to each particular country if only they were included in the free trade agreement.

A DYNAMIC COMPARATIVE ADVANTAGE ANALYSIS OF FRESH FRUIT AND VEGETABLE TRADE BETWEEN LATIN AMERICA AND THE UNITED STATES

INTRODUCTION

This paper analyzes the dynamic pattern of comparative advantage in fresh fruit and vegetable trade flows between the United States and Latin America. Our primary objective is to identify and characterize where and why expansion in production and trade may take place. An examination of several factors—including market demand, improving investment climates, technological advances, and trade liberalization—indicates a significant potential for the development and expansion of trade flows to meet open windows of opportunity in the United States.

Over the past 10 years, the U.S. fresh fruit and vegetable market has expanded considerably. The increased demand for fresh fruit and vegetables has been fueled not only by a transformation in consumer tastes and preferences, to accommodate a healthier lifestyle, but also by distinct demographic developments. Concurrently, U.S. production has fallen short of U.S. demand, leaving room for an increase in imports. For example, in 1973 fresh fruit and vegetable imports to the United States comprised 18 percent of U.S. consumption, but by 1992, imports met 24 percent of domestic consumption. The trend is even more pronounced for fresh fruit, where the import share of domestic consumption was 28 percent in 1973 and 39 percent in 1992.

Because the climate in the United States precludes year-round production for several commodities, an off-season period exists during which imports comprise the sole supply source and prices are high relative to the in-season period might be. As expected, nearly all fresh fruit and vegetable imports for any given year enter during this off-season period, which is called their window of opportunity.

Under trade agreements implemented during the 1980s, some Latin American countries already export to the United States without incurring tariffs or duties. However, several countries, including Argentina and Colombia, encounter trade barriers when attempting to export to the United States, decreasing profit potential. Removal of these barriers could provide some Latin American countries the pecuniary incentive needed to increase exports (or begin exporting) to the United States. Indeed, as this study will demonstrate, countries that currently do not export to the United States due to existing trade barriers may represent the greatest potential for increased trade and investment flows between the two regions.

Whether future trade agreements in Latin America will impact patterns of trade depends on the current configuration of comparative advantage. Intuition might suggest that the only important factor in deciding whether trade will occur is if the potential exporter realizes a price advantage vis-à-vis U.S. producers. While this is an important criterion, it will be shown that many other factors play a role in the movement of trade among nations. We discuss how natural resource endowments, human capital, physical infrastructure, macroeconomic policies, and other factors are responsible for a country's comparative advantage.

These factors and resultant discussion provide the groundwork upon which our assessment of import and investment opportunities is predicated. Our primary objective is to identify and characterize where this investment, and any resultant expansion in production and trade, will take place.

THE MARKET FOR FRESH FRUIT AND VEGETABLES IN THE UNITED STATES

In analyzing the U.S. market for fresh fruit and vegetable commodities, prospects for an increase in the demand for Latin American imports seem encouraging for two reasons. First, aggregate domestic demand in the U.S. has grown steadily, led by increased per capita consumption and changing preferences, while U.S. production has remained relatively constant. Second, Latin American countries are making investments in productive technology and changes in the way their economies are managed, often with international help, in order to participate more fully in world trade.

There are several reasons for the growing demand for fresh fruits and vegetables. Rising incomes, a growing health consciousness, and changing demographics are some of the major factors. In the United States, per capita consumption of fruit and vegetables has increased dramatically in the past 20 years. Indeed, between 1970 and 1992, U.S. per capita consumption of fresh fruit rose from 79.2 pounds to 98.8 pounds, and U.S. per capita consumption of fresh vegetables rose from 110.6 pounds to 133.4 pounds, increases of 1 percent and .8 percent per year, respectively.³

With respect to the change in demographics, an expanding elderly population that traditionally consumes large quantities of fresh fruit and vegetables, combined with a relatively unchanged number of 18- to 39-year olds who are consuming more fresh fruit and vegetables than in prior years, should ensure a modest annual increase in demand for fresh fruit and vegetables.

California and Florida dominate the U.S. supply of fresh fruit and vegetables. Together, these two states produce over 70 percent of the value of the U.S. fruit market and close to 50 percent of the

shipment of U.S. vegetables. California alone accounts for 50 percent of the value of all fruit produced in the United States.⁴ While there are a few commodities that are produced year round, production of fruit and vegetables is predominantly a seasonal activity in both states.⁵ Typically, when production in California is out-of-season, supply is provided by other states, mainly Florida.

As the U.S. market grows and the amount of available land in these two states, is diminished, there may be an increased market share available to Latin American producers.⁶ As we have discussed, imports increasingly make up the shortfall between U.S. demand and production. Table 1 provides a complete picture of fruit and vegetable imports from Latin America. Mexico is the dominant supplier of nearly every commodity. The remaining countries typically export about five of the commodities listed.

INTERNATIONAL TRADE CONSIDERATIONS

The expansion of NAFTA and/or the proliferation of free trade pacts within Latin America could have significant effects on the structure of comparative advantage within the region. Specifically, such pacts would eliminate the distortions and discrimination that currently exist because of tariff and nontariff barriers. This elimination may provide new windows of opportunity for Latin American exports in the increasingly competitive world market.

Tariff barriers affect Latin American (and other) exporters' comparative position with respect to the U.S. fresh fruit and vegetable market. These barriers often serve to diminish or obviate a Latin American country's comparative advantage.⁷ As a result, any unilateral modification of the U.S. tariff structure vis-à-vis a particular country could provide that country with the profit incentive necessary to induce export expansion. A hemisphere-wide trade pact, conversely, might not provide advantages to a particular country within the pact (although it certainly could), but it would almost certainly provide a competitive advantage over other-market producers.

Nontariff barriers also serve to restrict trade flows to some level equal to or below the free-trade level. Marketing orders for various agricultural products, established under the Agricultural Marketing Agreement Act of 1937, regulate the size, grade, maturity, and quality of products sold in the U.S. market. Quotas limit imports to some predetermined level, explicitly raising the price charged to the domestic end user. U.S. sanitary requirements, phytosanitary standards, animal health standards, and consumer safety standards also serve to indirectly block some agricultural imports. For example, Chilean grapes failed to pass U.S. phytosanitary standards in 1990. At the same time, \$24.5 million

worth of Mexican food was being detained for food safety reasons. Although Latin American countries have achieved significant progress in meeting U.S. standards, strict phytosanitary standards introduce an element of risk for the potential exporter (and investor) through the inherent threat of import discrimination.

INSTITUTIONAL MECHANISMS

Intragovernmental policy changes and reform have played an instrumental role in the renewed feasibility of free-trade expansion in Latin America. Only recently, Latin America was experiencing an economic crisis. Decades of import-substitution and other egregious economic policies had resulted predictably in large public debts, high inflation, inefficient state-owned enterprises, entrepreneurial disincentives, distorted capital markets and industrial products that were not competitive in world markets. Political turmoil and civil unrest added to the crisis. In the agricultural sector, years of government intervention in the form of production incentives, import tariffs, and export taxes and subsidies had deleterious effects on agricultural production and trade. Agricultural and other sector-specific interventions often adversely affected the macroeconomic environment by inefficiently diverting scarce resource flows.

Motivated by the desire to stabilize their economies and implement free-market policies in order to attract vital investment capital, Latin American countries are revitalizing the regional economic integration movement as a possible first step towards entrance into the global free market. In contrast to previous efforts, the goal now is to open up the Latin American economies to greater international competition by expanding trade within the region, dismantling tariff and nontariff barriers to trade, and removing barriers to foreign investment.

Latin American governments are also privatizing and permitting foreign investment in key sectors such as telecommunications, transportation, and energy. Foreign participation in these sectors may convey large economy-wide benefits and expose investment opportunities in tertiary sectors. The United States, recognizing the opportunities to increase investment and economic growth across the Americas, has responded favorably to these reforms. For example, the United States has initiated policies aimed at promoting greater hemispheric trade and investment, such as the Caribbean Basin Initiative (CBI) and the Enterprise for the Americas Initiative (EAI). Due to their applicability to the current study, these initiatives are briefly discussed below, with the understanding that the relative success of these localized

pacts will affect their participants' future willingness to enter into more expansive (and potentially riskier) agreements.

The Caribbean Basin Initiative: Results and Ramifications

Judging from the rise in imports for a group of 15 fruits and vegetables from CBI nations that occurred in the years immediately after the initiative was signed in 1983, the CBI had a positive effect on the fruit and vegetable trade. (See Figure 1). However, these effects have been somewhat limited in terms of increased exports to the United States from the member countries. Several rationales for this result apply to the current study as well. One explanation is that for the products in question, the relevant countries export a small percentage of their total production to the United States. As a result, any increased U.S. demand for the products can be met by slightly altering existing product flows and prices. A second rationale is that the elimination of initially limited or nonexistent trade barriers will result in little noticeable change in imports. For instance, if all applicable trade barriers serve to raise the import price by only 1 percent, abolishing these restraints will result in a limited increase in demand. Finally, and related to the first criterion, if the elasticity of demand is relatively high for the relevant product, a small increase in price will be sufficient to divert enough of the product to satisfy the increased demand in the U.S. market. All of these rationales may help explain, in part, the decidedly small import effects which resulted from the implementation of the CBI.

The Enterprise for the Americas Initiative and Its Effect on Trade Liberalization In Latin America

When it was announced in 1990, the Enterprise for the Americas Initiative (EAI) stated that its goal was the acceleration of economic and political reform in Latin America, with any resultant trade and investment opportunities subject to participation by the U.S. private sector. It included three main provisions: the reduction of Latin America's bilateral debt obligations to the U.S. government; the creation of a new investment promotion fund in the Inter-American Development Bank, funded by the United States, Japan, and the European Community; and the promulgation and preservation of unrestricted commerce through the creation of a Western Hemisphere free trade area.⁸

Under the provisions of EAI, the United States has offered market access, financial and technical resources, and debt reduction opportunities. The prerequisite for this assistance is that recipient countries continue to liberalize their trade and investment regimes, maintain sound economic policies

conducive to investment and competition, and manage their international debt obligations responsibly. Currently, these requirements are met by most countries in the region.

The governments in Latin America and the Caribbean are continuing to pursue aggressive macroeconomic, trade, and investment reforms.⁹ In fact, EAI was probably less a catalyst for change than the consequence of changes already in motion. Yet EAI has done more than highlight or reflect underlying trends; it has also helped reinforce them by fostering a new structure of incentives and rewards for market-oriented, export-led economic development in Latin America. One of the most significant steps taken by Latin America was the formation of regional trade blocs, which essentially encompass all Latin American countries.

Whether or not these alliances remain distinct trading blocs or enter into free trade deals with the United States (or other NAFTA countries) remains uncertain. In large part, the success of free trade in the entire Western Hemisphere depends on the success of the currently established trading arrangements. NAFTA was enacted under the provision that any one of the member countries could repeal the treaty if it produced great economic disadvantages. Likewise, if MERCOSUR or one of the other regional pacts fails, the member countries may be inclined to reject subsequent free trade arrangements. This outcome is more likely in those countries that do not have sufficiently strong fiscal and monetary control over their economies, in which case the economic policies required under free trade arrangements may prove impossible to sustain.

Hemispheric trade will probably be the result of individual countries' strong desire to seek bilateral negotiations with the United States. The eventual outcome of these trade arrangements will have effects on the future directions of trade and investment between North and South America. These trade arrangements will also have ramifications on dynamic comparative advantage in agricultural production and, consequently, on the opportunities for foreign investments. Therefore, the future of trade within the Americas, either via the expansion of NAFTA and/or bilateral trading pacts, or through the emergence of a multitude of individual, exclusionary pacts, is a fundamental aspect of this overall analysis of the changing environment for investments in Latin American agricultural sectors.

THE FACTORS OF DYNAMIC COMPARATIVE ADVANTAGE

Successful production and export of fresh fruit and vegetables are affected by many factors, including labor costs, seasonality, infrastructure, economic and political stability, government policy, transportation, natural resources, human capital, and international trade policies. While all these factors

are important their influence on comparative advantage varies by country. A relative deficiency in one factor may be more than offset by strong advantages in others. For example, lower labor costs relative to the United States may help Latin American countries offset or mitigate the negative effects of poor transportation and distribution networks. Several of the most important factors are discussed in the following sections.

Economic and Political Stability

In the last few years, the countries of Latin America have begun to experience significant economic and political change. Latin America is striving towards democracy and stable political regimes, economic growth, and greater participation in the international economic community. For example, Chile and Mexico, both widely perceived as politically stable, have been able to maintain the confidence of the international financial community through political and economic reforms.

Available evidence demonstrates a clear link between supportive government macroeconomic policy and export expansion.¹⁰ This assistance may include exchange rate devaluations, reductions or reconfigurations of export taxes, and the liberalization of imports for intermediate inputs. Indeed, the critical period is often less than three years, during which time the product has increased and maintained its market share while decreasing its costs and other start-up expenses. After this period, the well-developed commodity system can survive and retain its international competitiveness during a period of macroeconomic instability and uncertainty, provided it possesses an underlying low-cost operating structure, a modern infrastructure, and strong international marketing links.

From an economic perspective, Latin America has begun to recover from the debt crisis and negative growth rates of the 1980s. Inflation and debt burdens have been lowered, reducing risk for foreign investors and improving the environment for external financing. Although many countries are still suffering under heavy debt burdens, others such as Mexico, Argentina, and Chile have favorably renegotiated and reduced their external debts, paving the way for greater economic growth and increasing access to capital.

In addition, Latin American governments are realizing the importance of stringent structural reform programs. Tight fiscal and monetary policies, privatization, deregulation, and trade liberalization have been key elements of the most successful reforms. Investment disincentives increase with high inflation rates, excessive capital and labor costs, and an overvalued exchange rate—all influenced by government policies. Although many Latin American nations are still in the early stages of economic

reform, if the successes of Mexico and Chile can be emulated, Latin America has the potential for significant regional growth.

Government Policy

Given the trends toward economic reform and a general improvement in economic outlook, prospects for agricultural growth are good. However, Latin American governments will have to implement agriculture-related policies that strengthen the agricultural sector and its comparative advantages. Historically, the terms of trade for Latin American economies have been turned against agriculture through policy neglect, overvalued exchange rates, export taxes, and the high cost of inputs due to industrial import substitution policies. In particular, import-substitution fostered inward-looking strategies which ignored the potential benefits of agricultural export growth.

As Latin American governments implement programs of economic liberalization and structural reforms, agriculture is being modernized. Price distortions and import barriers have been removed, and governments are developing comprehensive strategies to improve agricultural efficiency and productivity. Government agriculture policies that expand agricultural production and encourage exports, such as directing expenditures for irrigation projects, are necessary to increase farm incomes and agricultural growth. In the past, agriculture growth was largely constrained by market inefficiencies caused by government interference in production and trade. Today many Latin American governments have eliminated producer subsidy programs, import barriers, and pricing systems in order to correct market distortions and increase agricultural efficiency. Economic liberalization, financial and monetary reforms, and more favorable investment climates also have improved agricultural economies and facilitated greater capital investments. Increasingly, the agricultural industries of Latin America are fueling economic growth. Chile's conversion to a free-market, export-oriented economy, for example, allowed the agricultural industry to nearly double production in a ten year period. In Colombia, agriculture has been growing at approximately 5 percent per year and has one of the country's highest sectoral growth rates.

Many reforms eliminated incentives, i.e., market distortions, which had benefited the agricultural industry, such as export subsidies, price bands, and special credit provisions. In the case of Mexico, for example, it is expected that liberalization will hurt most of the small farmers who were dependent on government assistance in the past. However, many Latin American countries maintain programs which promote nontraditional agricultural exports via access to credit, export financing, and reduction of input

import duties. These programs could provide enough incentives and relative comparative advantage over other productive sectors to stimulate commodity booms in nontraditional fruit and vegetable exports. Trade liberalization and economic reforms are expected to continue in the future, although the prospects for currency overvaluation, high inflation, and other variables that could adversely affect exports vary by country; Brazil, for example, is still fighting hyperinflationary tendencies.

The comparative advantage of the Latin American fresh fruit and vegetable trade is also affected by the institutional environment in which the commodity systems operate. Within the institutional environment, the most important factors to agricultural comparative advantage are property rights, rules and conventions specifying entry conditions and boundaries on cooperative and competitive practices (standards), licensing of producers and marketing agents to reduce transaction costs, and regulations which establish testing or inspections of products, handling procedures, and nutritional labels. This institutional environment has a relatively greater effect in Latin America than in industrialized countries because in Latin America it is both less developed and more discriminatory.

Latin America is generally in concordance with international norms in terms of property rights, intellectual property rights, and competitive practices. However, licensing, testing and standards regulations, and safety procedures are less established, and have been the source of export problems in the past. Most Latin American producers and governments realize the need for rules and standards which are compatible with international norms in order to market competitive, quality goods. In general, the likelihood of export success varies among countries.

Physical Infrastructure

Horticultural exports such as fresh fruits and vegetables require a high level of physical infrastructure in shipping, packaging, and storage facilities. The initial costs of export production are high, and exportation often requires a long “learning” period to establish international distribution links. As a recent entrant to horticultural trade, Latin America is at a considerable disadvantage, particularly relative to U.S. producers, in terms of these infrastructure requirements.

During the financial crisis of the past decade, many investments for agriculture-specific and nonspecific items were postponed. However, governments are realizing that an inadequate infrastructure is a disadvantage that can severely limit economic growth. Developments in Asia have proven that private investments flow to countries that can offer dependable infrastructure on top of sound economic management and a trained workforce. Low labor costs do not necessarily mean lower production costs if

variables such as transportation are expensive or timeconsuming. Latin American governments are coming to understand the need for paved roads, modern telecommunications networks, and reliable energy sources.

The World Bank estimates that Latin America's required annual infrastructure spending is about \$2 to 3 billion for highway construction and repair, \$3 billion for telecommunications, \$10 billion for water and sanitation, and \$20 billion for power. The International Finance Corporation estimates the replacement cost of water and sewer systems in Latin America at approximately \$120 billion. One estimate projects that satisfying only Mexico's infrastructure needs to the end of the decade would require an investment of \$250 billion. Although the costs are immense, these potential infrastructure projects represent tremendous opportunities for private enterprise.

International development organizations are beginning to fund heavily some infrastructure projects in Latin America.¹¹ For example, the International Finance Corporation recently put \$250 million of its own funds into Latin American projects worth about \$1.5 billion. In addition, the United States and Mexico have initiated a program of infrastructure investment along the border, requiring \$15-20 billion. Nonetheless, most of the infrastructure development in Latin America will have to result from initiatives in the private sector.

Transportation

Two inherent marketing obstacles to growth in high-value fresh fruit and vegetable exports between North and South America are the geographic separation of supply and demand and the perishable nature of some of these products. The geographic disadvantage facing Latin America is even greater given the demands for higher-quality fruit; after a 14-day boat voyage from Chile to the U.S. marketplace, the product inevitably loses freshness and appearance quality.

Transportation is of considerable importance, especially with respect to perishable fruit and vegetables. Poor distribution channels, such as improper vehicles, containers, loading and storage facilities, can adversely affect quality. There are great disparities among Latin American countries in terms of their transport infrastructure. In a recent survey among U.S. multinationals, Chile's infrastructure was considered the best in Latin America, followed by those of Brazil, Venezuela, Argentina, and Mexico.¹² However, while Chile has modernized its ports, maintained a reliable, efficient energy sector, and is quickly developing its communications sector, the quality of roads in Chile is still low—an indication of the sort of unequal development that characterizes many countries'

infrastructure. Peru, Brazil, and Mexico all have started to reform their inefficient port services, which are heavily labor-intensive and carry costs that are often five times as high as those of their European counterparts.

In another respect, there is an advantage to both the United States and Latin America as a result of the location of Latin American production. Fresh fruits such as grapes and apples are already well-known and demand is well-established in North American and other industrialized markets. Latin American producers can take advantage of this existing demand and also the distribution system for domestic and imported fruit. This has aided the development of a production and export base in Latin America and has extended the marketing season of the commodity in the United States.

Marketing Infrastructure

Infrastructure can often be improved and/or enhanced via the prior or parallel development of complementary industries which lower input or investment costs or create additional demand. For example, the production and marketing infrastructure developed initially for wheat in Argentina and Brazil was subsequently used for soybeans, splitting overhead costs between the two crops. Furthermore, on the demand side, the Chilean temperate fruit trade has benefited from the development of domestic fruit processing industries which absorb surplus or second-grade fruit. Increasing investments in fruit and vegetable processing industries could significantly improve the marketing infrastructure in Latin America.

There have been improvements in the structure of agricultural production in Latin America the last few years, although these improvements are not uniform among all countries and products. Certain countries, most notably Chile, have significantly greater technology and productive capacity. In some instances, specific products receive special attention because of their high export value. For example, apple growing is one of the least technologically demanding types of production in the fruit growing business. Until recently, many farmers owned only a few hectares of land and used very little harvesting technology. However, big international fruit companies, such as Unifrutti, David del Curto, and AgroFrio have started to plant and/or expand their own orchards and oversee them directly to ensure a supply of top-quality fruit. These traders are planting high-density orchards of favored species, using expensive drip irrigation, and experimenting with mechanized picking and pruning.

Marketing efforts vary greatly by country; in Chile, extensive efforts on the part of government and semipublic organizations to market Chilean fresh fruit and vegetables, among other products, have

resulted in a relatively efficient and successful marketing infrastructure. In Mexico, conversely, marketing has long been ignored in the government's agricultural policy and the lines of distribution are distended.

Most countries are just beginning to establish long-term marketing and distribution channels. In Guatemala, international development assistance agencies, private companies, and public agencies worked together to provide the necessary resources for a cooperative of nontraditional vegetable farmers to open up export channels, build cold-storage facilities, provide grading of export products, and secure access to export markets. However, this project was not implemented nationally, and the quality varied by region and cooperative, as is the case with most Latin American countries.

Necessary infrastructure improvements include sector reforms in areas such as market information. For example, agricultural producers and exporters in Latin America do not always have sufficient information on their commodity market. In the case of melons, efforts to create a statistical production database have been stymied due to a lack of funding and cooperation among the exporting countries. There are no officially published statistics on the melon export industry, and therefore there is no readily available information on plantings, harvest dates, shipping predictions, and volume summaries.¹³ Government intervention here could provide invaluable information that would substantially reduce production and exporting risk.

Other infrastructural necessities include well-developed stock or financial markets to pool risks associated with investments in the production infrastructure. For example, investments in certain modern processing, storage, transport, and trading facilities might provide an operating capacity in excess of current supplies (depending on how well developed the commodity production is); the large initial operating costs combined with the uncertainties about future raw materials may act as a barrier to investment. Furthermore, the availability and cost of credit is an important factor in the entry and viability of firms and individuals in the marketing system. The processing, transport, and storage of raw materials and commodities takes time, and commodity investment depends on access to financing, both to pay for raw materials or commodities purchased, and to cover interest and other costs of goods held in storage.

Natural Resources

The opportunities for growth and investment in Latin America are significant. Latin America possesses vast agricultural resources that are undercapitalized. For most Latin American countries,

agriculture has the potential to be an important source of economic growth for many years into the future.

Latin America has a long history of successful agricultural production. Generally, both climate and natural resource endowments favor the production of a wide variety of agricultural goods, including tropical and temperate products. A crop's growing-condition requirements might vary from country to country. For example, climate and soil conditions permit a certain type of asparagus to grow in Guatemala in nearly half the time it would take in the United States.¹⁴

Many Latin American producers have captured market share based on their position as "complementary suppliers." Imported products from Latin America enter the United States and other Northern Hemisphere markets during the domestic off-season. These imports supplement domestic production and extend the availability and marketing season in the United States. In the process, they also reduce overhead in the U.S. distribution and marketing system by spreading costs over greater volume.

Competition for market share in the international fresh fruit and vegetable trade is intense. In the U.S. import market, Latin American producers compete against other Southern Hemisphere countries, such as Australia, New Zealand, and South Africa, which are also significant complementary producers of fresh fruit and vegetables. In addition, Latin American producers often compete directly against U.S. producers when the imported product has a marketing season similar to that of the domestic product.

In most countries in Latin America, the agricultural sector maintains a dominant position in terms of national income, employment, and exports. Trends towards diversification of production into nontraditional products and the introduction of newer plant varieties aimed at the export market indicate continued growth in the agricultural sector. One estimate predicts growth of 1.6 to 3.4 percent per year in horticultural exports from developing countries to the year 2000.¹⁵ Exports of traditional crops are falling, while nontraditional fruit and vegetable exports, such as apples, pears, tomatoes, asparagus, and many others, are rising considerably. In addition, there have been increases in regional production and export of processed and frozen fruit and vegetable products.

The diversification of agricultural exports has been emphasized by many countries in the Latin American/Caribbean region in recent years. Diversification is partly the result of declining world prices and demand for many of their traditional export commodities, such as sugar and coffee, and partly due to attempts to satisfy growing market demands, such as in specialty fruits and vegetables. Diversification

also grew out of Caribbean Basin Initiative projects to expand Latin America's economies by increasing exports of nontraditional fruit and vegetables to the U.S. market.

Human Capital

Because fresh fruit and vegetable products are labor intensive, Latin America's comparative advantage is derived primarily from lower labor costs, sometimes as low as 5 percent of U.S. costs.¹⁶ This labor cost advantage is particularly important because in general Latin American producers do not attain the same yield averages as their U.S. counterparts.¹⁷ Lower labor costs have enabled Latin America to maintain its market share in fresh fruit and vegetables against producers in the United States and other countries that may possess advantages in production technologies.

While low-wage labor is plentiful in most of Latin America, the region suffers from a well-documented shortage of skilled human resources. Human capital plays an important role in determining the productivity of a country's natural resources. The extent to which these resources are modified depends on access to technology, knowledge of the proper application of technology, and education in the use of farming techniques most appropriate for the local growing conditions. Serving as a medium for using technology and physical capital, skilled labor can increase the productivity of land by developing seed varieties better suited for the region's climate and implementing higher yielding cultural management techniques.

While low labor costs have given Latin America the opportunity to build an agricultural export industry, Latin American governments must increase their investments in research and technology, disseminating the results to local growers in order to remain globally competitive against the major U.S. production regions of California and Florida. Because agricultural technology is location specific, these technologies must be developed and tested under the ecological and economic conditions in which they will be used. Seed varieties, for instance, must be acclimated to local conditions. Therefore, agricultural producers in Latin America cannot rely merely on the transfer of technology from the United States and other industrialized countries. Developing their own research base is fundamental to becoming globally competitive and sustaining sector growth.

Research in the United States is supported by the U.S. Department of Agriculture (USDA) and through a system of land-grant colleges. Comparatively, Latin American growers are at a disadvantage as most universities in Latin America are not involved in agricultural research and funding for research projects is often meager or nonexistent. Mexico is considered the most advanced exporter but many

areas are still relatively primitive compared to the United States. Despite lower labor costs, lower yields make it unprofitable to export to the United States.

Continued research is vital if Latin American growth in the agricultural sector is to continue. In the past few decades, public expenditures in agriculture have been neglected in favor of industry. For example, the Mexican government has all but eliminated the budget for agriculture research.¹⁸ All countries need technological advancement, education, and favorable government policy.

Capital Investment

The recent interest of foreign investors in Latin America is not the first such flurry—the last investment surge was in the 1970s, when banks and international lending organizations lent hundreds of billions of dollars to Latin American governments and businesses. Unfortunately, those loans were used to cover budget deficits and finance mismanaged projects. In addition, foreign companies that established production sites in Latin America were faced with high inflation, attempts at nationalization, and government policies favoring local companies.

Today, foreign investors are confident that the overall investment climate has improved considerably since the 1970s. Most foreign capital is selectively lent to privately-owned industrial groups for specific projects, and foreign investors often refuse to commit to a project unless they have reputable local partners to share the risk. Since 1989, there has been a substantial capital movement to Latin America, attributable to growing economies, an improved investment climate (due in part to recent economic liberalizations), and privatization of state enterprises. Latin American governments have negotiated agreements with the commercial banks and international lending organizations to reduce egregious debt burdens. After a long history of debt default, Latin America is borrowing fresh capital once again.

These policy changes in Latin America have been dramatic and have occurred only recently, thus they lack the test of time. Many foreign investors wonder whether open trade and investment policies and stable economic growth can be sustained into the foreseeable future.

In order to understand the current economic climate in Latin America, as well as what the recent changes might indicate for the future of trade and investment policies in Latin America, it is important to understand how and why the trade and investment regulations of Latin America evolved over time.

Most economic policies from the 1950s through the early 1980s were based on industrial development via strategies of import substitution and ideas of economic independence.¹⁹ The

governments of Latin America pursued these strategies by imposing high tariff and nontariff barriers on imports, regulating foreign investment, restricting currency exchange, maintaining high-valued exchange rates to keep the prices of imported inputs low, and using subsidies and other incentives to encourage domestic manufacturing. These policies resulted in inefficient, uncompetitive industries, unprofitable state enterprises, distorted capital markets, and substantial public debt.

With respect to foreign investment, Latin American governments historically have been unsuccessful in achieving a balance between foreign investment and sovereign control. In the late 1970s and early 1980s, many Latin American countries feared becoming “dependent” upon foreigners for their economic and political stability and, therefore, enacted laws that restricted the amount of foreign investment allowed in their countries. Many countries feared that foreigners would take control of important natural resources and business enterprises. They also feared that multinational corporations would engage in restrictive business practices, influence political decisions, and ignore critical social problems. Most importantly, these countries feared becoming dependent upon direct foreign investment. They were worried that foreign investment could displace local national entrepreneurship, preempt financing of local ventures, and have negative effects on their balance-of-payments accounts. Many Latin American countries came to believe that direct foreign investment was a hindrance to development and eventual self-sufficiency; consequently, they adopted foreign investment laws that either directly or indirectly restricted or prohibited foreign investment in their countries.

The restrictive foreign investment laws of Latin American countries in the 1970s contained several common elements including application and approval procedures (through which direct foreign investment must pass before being allowed in the country), equity participation restrictions or outright prohibitions, and technology transfer restrictions. These restrictive laws gave the governments significant control over investments and, as a consequence, foreign investors became discouraged and investment slowed.

Furthermore, capital flight has had significant ramifications on the Latin American economies since the 1970s. In order to avoid domestic economic and political risk, foreign assets were purchased with the proceeds of large loans from foreign banks. These capital outflows largely offset capital inflows, although Latin America actually experienced positive net foreign investment flows through 1981. In fact, Latin America experienced strong economic growth throughout the 1970s. However, changes in the economic environment in the early 1980s severely affected Latin America. Net foreign investment flows turned sharply negative in 1982 and 1983, as foreign banks reduced new lending to the

region while requiring interest and principal payments on existing loans.²⁰ Reduced lending coupled with decreased world demand for its exports meant that Latin America faced severe economic crises throughout the 1980s, adversely affecting both investment and trade growth.

As a consequence of this economic crisis, and in response to the urging of international lending organizations such as the International Monetary Fund and the World Bank, Latin American countries began to implement trade and investment reforms.

The Costs of Production

The factors of comparative advantage in trade that were just reviewed may be summarized in per-pound costs of production of an individual product in a particular country. Unfortunately, detailed and reliable costs of production in Latin America are essentially unavailable, or at the very least are inconsistent and incomplete. Given the disparities in production technologies and the resulting differences in quality and quantity of yields, direct-cost comparisons with the United States would be difficult even if Latin American costs were available. However, we have developed an indirect approach which provides much insight, and can be used reliably in the subsequent analysis of capital and trade flows. The indirect cost advantage exercise that follows utilizes all available information about crop production costs in Latin America and yields a simple but informative and useful statistic.

We call the statistic the *measure of potential comparative advantage*. It measures the foreign country's *best-case* production cost advantage over the United States in the production of a particular product. The key assumption is that the only differences in cost between the United States and the Latin American country are in labor and export costs. We assume that technology levels in Latin America and the United States are equal.²¹

Obviously, this assumption is inaccurate. That is why the measure of potential comparative advantage is of the country's best-case production cost advantage. To the extent that the Latin American producer is deficient relative to the U.S. producer in the other factors of comparative advantage, it is unable to realize its best-case advantage. Put another way, the measure of potential comparative advantage indicates the extent to which the Latin American producer can be inefficient relative to the U.S. producer, net of labor and export differences, and still enjoy at least cost parity.

Agricultural production activities and costs can be broken down into several stages. Preharvest activities include establishment and growing period work involving preparation of the land, planting, and maintenance of the crop. It involves materials costs such as seeds, pesticides, fertilizers, and costs

associated with the use of capital equipment like tractors and various implements. Only a small number of higher wage, skilled labor hours is employed to perform these capital-intensive activities.

Harvest and postharvest activities include actual harvesting (which is labor intensive for fresh fruit and vegetables), packing, and shipping to ports where the product is available for export to the United States. Export costs include international transportation, insurance, and, of course, applicable duties and tariffs.

The total of these three types of costs gives the cost of the product as it sits on the dock in the United States. From there, the cost can be compared to the costs of packaging U.S. production and making it comparably available at the wholesale market. Using this data, we develop the measure of comparative advantage.

Production costs for 1992 have been developed using California and Florida Cooperative Extension cropping budgets.²² These budgets include all of the Latin American countries' activities except export costs, which of course do not apply. These costs reflect the sophisticated technology used in production in the United States. to make the high labor content more efficient. To the extent the Latin American producers are less sophisticated than their U.S. counterparts, their nonlabor costs may be lower, but their labor content will be higher.

Of course, lower labor costs in the Latin American countries provide their primary advantage while export costs represent their primary disadvantage. We use these two facts to create our measure of comparative advantage. First, let costs in the United States, C_{us} , be split into labor, L_{us} , and other costs, O_{us} .

$$C_{us} = L_{us} + O_{us}$$

Similarly, in the Latin American country, adding export costs, X_{la} :

$$C_{la} = L_{la} + O_{la} + X_{la}.$$

If we assume that $C_{us} = C_{la}$, we see that the potential for inefficiencies by still-profitable Latin American exporters is captured by the relative magnitudes of O_{us} and O_{la} , as indicated by the ratio:

$$\frac{O_{la}}{O_{us}} = \frac{C_{la} - (L_{la} + X_{la})}{C_{us} - L_{us}}$$

The idea is that the more the labor-cost advantage and the less the export-cost disadvantage, the more latitude the Latin American producer has to be inefficient. If we assume the Latin American producers lose their comparative advantage when C_{us} equals C_{la} , the difference between L_{us} and $(L_{la} + X_{la})$ drives the potential advantage enjoyed by the Latin American producer.

This is captured by calculating the above ratio from U.S. costs, export costs, and the difference in labor costs. We know U.S. costs. As will be seen, we know export costs and we know the ratio of agricultural wages in the various countries. Thus we can calculate our measure of comparative advantage.

This measure gives us a solid indicator of where profit is or could be made in expanding trade, or where investment to expand trade may be made. We will use this measure, along with specific information about each product and country, to narrow our work on capital flows.

In the following discussion we present the measure of potential comparative advantage for each product and country combination we have chosen. Using the measure as a guide, we will identify product-country combinations that are candidates for an increase in exports to the United States. In the country-by-country discussion, we will address that potential along with the status of other comparative advantage factors.

The analysis will indicate where we might expect investment in these factors: the traditional production technologies such as equipment, seeds, government extension services, roads, docks, packing and storage facilities, transportation equipment, and others. These investments would only make sense if the analysis indicated a potential comparative advantage.

Before examining the specific products selected for our study, however, we discuss an area of technological progress which shows great promise for changing the way countries and companies bring new varieties of agricultural products to the market. Indeed, it is our contention that this technology, properly applied by specific Latin American countries, will provide them with distinct comparative advantages vis-à-vis the United States.

BIOTECHNOLOGY DISCUSSION

In agriculture, the farthest reaching and technologically advanced achievements in recent years have occurred in the application of genetic engineering, or biotechnology. “Genetic engineering in foods involves the insertion (or alteration) of one or more genes with a clearly defined and desired function into (in) plants... that are used for human food or animal feed.”²³ There are several advantages of biotechnology over conventional genetic breeding techniques. First, time and other resources are minimized. The length of the development process for new varieties can be shortened substantially by operating at the cellular level in the laboratory rather than by breeding mature plants in the field. Second, classical breeding may involve numerous breeding attempts over many generations to “set” a specific trait. With genetic engineering, desired genes and traits can be incorporated immediately, and undesirable traits can be omitted. Third, unlike conventional breeding, genes from unrelated plants and animals can often be interbred with genetic engineering.²⁴

Numerous traits are candidates for alteration with biotechnology. Foremost are handling, shipping, and storage characteristics. Currently, nearly half of all fruits and vegetables in the United States are lost due to post-harvest spoilage, with an associated cost of \$5 billion dollars a year.²⁵ According to Autar K. Mattoo at ARS’ Plant Molecular Biology Laboratory, for tomatoes alone, thirty to forty percent of the crop is lost annually due to bruising during harvesting, shipping, and storage.²⁶ Ninety percent of all fresh fruit and vegetables are picked green before they have ripened, and then are gassed and refrigerated for shipping. This process alters the taste of these fruits and vegetables and toughens their texture, decreasing their marketability. Biotechnology offers an opportunity to alter the genetic structure so that the ripening process is delayed and the product ships well and ripens to the more desirable state upon display.

While improvement of handling characteristics will have a secondary, positive effect of improvement in taste, appearance, and texture, these characteristics can and will be altered with biotechnology as well. Other traits that are the subject of ongoing research include the ability to withstand temperature extremes during growth, improved fruit quality, greater yield, larger size, and resistance to insect infestation and disease.

In the following section we first discuss biotechnology activities by various U.S. entities. We then briefly consider several important issues related to the success of biotechnology in agriculture. Next, we

discuss the few Latin American activities in biotechnology. Finally, we address the general future of biotechnology, but particularly in Latin America.

Biotechnology in the United States

The U.S. government has provided continuous support for research and development in genetic engineering. The ARS is dedicated to solving problems and increasing productivity through basic research. ARS allocates \$114 million to improving varieties of plants, breeding better animals, and developing new products. While biotechnology is not an ARS research program in itself, it is a component of almost every ARS research effort. ARS works closely with industry to transfer new knowledge and technologies to the private sector for further development and commercialization.²⁷

Currently, ARS scientists have been working on a number of exciting projects. One project involves the discovery of the “EVG” gene, which is responsible for making peach trees less vulnerable to early-fall and late-spring freezes.²⁸ In another project, scientists have searched the globe for citrus that can withstand colder temperatures and disease in order to develop more reliable domestic citrus. Now, for the first time, scientists have isolated a gene in citrus responsible for such desirable traits as fruit quality, pest resistance, and cold hardiness. According to Dr. Randall P. Niedz of the ARS, this gene is temperature regulated.²⁹

Another area of progress involves lettuce production. According to ARS scientists, mini-iceberg lettuce, with a crisper texture, sweeter taste, and more tightly formed head than its natural predecessor, has been created by altering a lettuce gene critical to a natural growth hormone called gibberellin. This mini-iceberg lettuce, which may appear in restaurants in a few years, is perfect for consumers who are not able to use a whole head of lettuce before it spoils. Researchers have been able to show that this compact lettuce would flourish in at least three of California’s prime lettuce-growing regions, the Salinas, San Joaquin, and Imperial valleys.³⁰

American firms currently lead the world in agricultural biotechnology. The majority of them choose to concentrate on the biopesticide market, which poses fewer technological challenges. By focusing on the biopesticide market they expect to earn revenue more quickly, but the markets for these products are small. For example, in the case of tomatoes, the seed industry is worth \$15-20 million a year, while the fresh market for tomatoes is valued at about \$4 billion a year.

Outside the biopesticide market two firms, Calgene of Davis, CA, and DNA Plant Technology Corporation (DNAP) of Cinnaminson, NJ, have conducted an immense amount of agricultural

biotechnology research. These firms have positioned themselves to sell brand name produce resulting from their research activities. To accomplish this, Calgene and DNAP are working first towards brand name recognition, since consumers do not usually think of produce in these terms. After building brand name support, they will introduce genetically altered produce under these names.

The tomato industry, with its focus on delayed ripening, is the test case of agricultural biotechnology. Calgene and DNAP have positioned themselves for the fresh market by teaming up with major fresh produce players to distribute brand name tomatoes. Calgene Fresh, a subsidiary of Calgene has teamed up with Campbell's Soup, and DNAP has joined forces with DuPont.

Calgene has established itself in the fresh tomato industry with the "FLAV SVR" brand. The product promises longer shelf life and better taste than ordinary tomatoes. The technology alters the "sense" gene with a reverse oriented "antisense" gene. This delays the production of ethylene, which causes ripening. Delayed ripening increases the shelf life of the tomatoes and also improves taste because tomatoes ripen more fully on the vine. Currently, tomatoes, like most fruits and vegetables, are shipped green and then gassed and refrigerated for shipping. Delayed ripening increases the sugar and nutrient content and produces a better-tasting tomato.

Field test marketing of the FLAV SVR has been successful in California, Florida, and Mexico. Three Floridian growers (Taylor and Fulton, Gulfstream Tomatoes, and Meyer Tomatoes) and unidentified Californian and Mexican growers began planting FLAV SVR seeds in 1994. Calgene expected FDA approval for FLAV SVR before the end of the year.

Meanwhile, to build brand loyalty, Calgene successfully test marketed and introduced its MacGregor'sTM premium brand. Introducing premium brand produce is a feat in itself. The genetically engineered FLVR SVR tomato will be then be introduced through the MacGregor'sTM brand when it receives FDA approval.

According to a 1993 estimate by Montgomery Securities, Calgene should be selling \$54 million worth of fresh tomatoes in 1995 and \$185 million worth by the year 2000 (see Table 2.). Also in 1993, Maureen McGann, an agriculture biotechnology analyst at Merrill Lynch, expected FLVR SVR to deliver \$60 million in revenue by 1996.³¹

DNAP focuses on improving product variety based on consumer needs. Some of the fruit and vegetables characteristics that DNAP is working to improve include flavor, sweetness, texture, and shelf life. DNAP is pursuing a two-track strategy to bring value-added foods to the marketplace. The first track involves the use of advanced-breeding by conventional techniques, while the second makes use of

genetic engineering advances. The advanced-breeding line is currently marketed under the "FreshWorld Farms" label.

While DNAP's current product line contains only fruit and vegetables from advanced-breeding techniques, it plans to introduce a genetically produced tomato by 1995. This tomato will have a shelf life of six to eight weeks instead of the normal ten to fourteen days. This is accomplished by turning off one or more of the genes involved in the ripening process, delaying the production of ethylene. Transwitch gene suppression technology is applied to the gene (ACC Synthetase) which is responsible for the process.

DNAP plans to use the Transwitch technology for other products, including sugar snap peas with enhanced sweetness, multicolored peppers that stay fresh longer, and improved tropical fruits. DNAP owns the rights to use the antisense technology for sixteen other fruits and vegetables including bananas, broccoli, cucumbers, peppers, strawberries, and watermelons, as well as seven ornamentals: carnations, chrysanthemums, geraniums, gerberas, lilies, poinsettias, and roses.³²

Another firm, Monsanto (St. Louis, MO) has the rights to use the anti-spoilage technology for apples, avocados, nectarines, peaches, and pears. Monsanto has also developed a virus-resistant potato. Growers currently spend \$250 per acre on pesticides to kill insects that spread the viruses. Reducing use of these chemicals not only saves growers money, but, also helps to protect beneficial insects and water quality. To date, field experiments have shown resistance to two major potato viruses, PVX and PVY.³³

Biotechnology Issues

In an analysis of the effect of biotechnology on trade flows, there are many issues to consider. Financing is crucial to the development of the original technologies and in their application to particular climates. Government policies and laws, especially those involving intellectual property rights, will have a tremendous impact on the willingness of firms to invest in this area, especially in Latin America. The regulatory process has an enormous impact on the progress of this technology. Public acceptance (which influences regulation) will greatly affect the developing market for genetically altered products.

As is usual in fledgling high-tech industries, financing is a major hurdle. Even successful companies like Calgene and DNAP have suffered losses for many years. Both have teamed up with companies with extensive resources to support their currently unprofitable research.

The future of biotechnology depends heavily on international intellectual property laws. Firms and ground-breaking researchers need to have assurances they will be able to appropriate both the risk and the potential benefit of their innovation, in the United States as well as Latin America. Enzo Biochem (Farmington, NY) and Calgene are locked into a legal battle over the claim to the antisense gene responsible for the delayed ripening of tomatoes. Enzo claims that antisense is universal and works in all species, including plants. However, Calgene has a patent covering antisense technology in crop plants. Further complicating the case is ICI (Bracknell, UK) which has claimed patent interference against Calgene. Both Calgene and ICI are using the same antisense patent technology to modify the same tomato gene. A lengthy legal battle is possible, one result of which may be a delay in these products reaching the market.³⁴

On the regulatory front, both the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) are crafting policies for genetically altered foods. However, the Clinton administration has substantially slowed the pace of deregulation.³⁵ Biotechnology companies such as DNAP are working with the Food and Drug Administration and the Department of Agriculture to formulate an acceptable and realistic regulatory policy so they can proceed with the production and marketing of genetically produced foods.

With stiff competition expected from France, the United Kingdom and Japan, the United States may not have the luxury of further delays. One of the crucial variables in the coming years will be the speed with which a genetically engineered product can be brought to the market. Government success at encouraging development activities and lowering regulatory barriers will play a major role in the success of biotechnology companies in the United States.

However, there is some public uncertainty, and organized opposition, such as the Pure Food Campaign in Washington, D.C., concerning genetically altered foods. To combat these fears, DNAP plans to use primarily plant-derived genes. There are concerns that these genes may make humans resistant to antibiotics. For example, the Calgene FLVR SVR tomatoes contain a protein that is resistant to the kanamycin antibiotic, raising questions as to whether the consumer will become immune to this antibiotic. Some supermarkets advertise that their dairy products do not come from cows that have been injected with hormones, targeting the fears that consumers have about genetically altered foods.

Biotechnology in South America

Developing countries fear that biotechnology will result in loss of market share and further widen the gap between rich and poor countries. They are concerned that the more developed countries will capitalize on their technical expertise to create more competitive products while at the same time the developing countries cannot use biotechnology because they lack the capital, the luxury of time and, perhaps more importantly, the human resources to use biotechnology productively.

While Latin American officials have expressed strong support for biotechnology ventures and have even made investments in biotechnology, problems remain. U.S. demand for foreign science graduates and the attractiveness of working in the United States often mean that much-needed trained personnel do not return to their native country. This is a problem that will have to be solved before much progress can be made.

Business and government will have to work together to support project work. Costa Rica has been successful in acquiring technologies from abroad because it has a more sophisticated export industry. Growers are able to develop ties with foreigners, who in turn get involved in technology improvement and transfer. For the most part, the rise of asparagus production in Guatemala and temperate fruit production in Chile were the result of direct technology transfer. Technology development was also critical to the success of melon growing in Honduras.³⁶

As an indication of the fragility of high-tech efforts in Latin America, the private agriculture biotechnology industry in these countries has been performing poorly. In July 1991, BAT Industries' Souza Cruz announced that it would close down Bioplanta Tecnologia de Plantas Limitada, then the largest ag-biotechnology firm in Brazil, due to losses. "President Sr Iran Pedro said that biotechnology was still new in an unprepared Brazilian market."³⁷ The company had accumulated losses since its creation in 1985. Bioplanta had been working on micropropagation methods for potatoes, grapes, tomatoes, flowers, citrus, and strawberries. Bioplanta's main competitor, Biomatrix, established by biologists from academia and Agroceres (Brazil's largest seed company), had closed down the previous year due to losses.

The Future of Biotechnology

What does the future hold for biotechnology in Latin America? It may be that until the more developed countries are further along in using this exciting new technology, Latin America will remain on the fringes of the developing market. As technologies are perfected, and if there is a market, U.S.

companies will probably take advantage of their expertise to make specific investments in applying the technology to improve the product characteristics

The impact of biotechnology could be considerable, but most of the activity will take place in developed countries like the United States and Japan. A detrimental development for the trade of fresh fruits and vegetables with Latin America is research to extend the growing season for domestic producers, closing the window of opportunity for Latin American producers. However, if the technology is transferred freely to Latin America, it may solve some of the problems those countries face in capitalizing on their comparative advantage. For example, currently some fruit and vegetable exports do not occur because of the transportation time involved. Delayed ripening may make Latin American exports possible in these instances.

SELECTED PRODUCT AND COUNTRY DISCUSSION

It is useful to limit the scope of this study to a subset of countries and commodities. Undertaking a study of more than 15 Latin American countries and nearly 70 fruits and vegetables would not allow for detailed investigation of present and future trade patterns. Instead, we used selection criteria based on the factors of comparative advantage introduced previously. In doing so, we emphasized the opportunity for and likelihood of growth in imports. We chose the following eight products: asparagus, bell peppers, cantaloupe, cucumbers, table grapes, oranges, strawberries, and tomatoes. We selected six countries: Argentina, Chile, Colombia, Guatemala, Honduras, and Mexico, each of which produces at least five of the eight products.

The commodities were selected on the basis of several criteria which taken together serve as accurate indicators of a commodity's export potential. These include a commodity's market-value-to-shipment-cost ratio, the size of the U.S. market, and the expected future size of the U.S. market which is predicted by measuring the growth rate in the consumption of the product. (See Table 3 for a summary of these criteria for the selected products.) Another critical parameter for selection is that the product must be harvested and available for export in periods characterized by high U.S. domestic prices. The product-selection methodology also considers several subjective factors that indicate significant growth potential, such as recent investment activities by government and development organizations. We also took into account the potential for advances in technology, particularly biotechnology, to create an exporting opportunity in the longer term.

The criteria for country selection include the following: economic stability, political stability, suitable growing climate, necessary physical infrastructure for production and export, low labor costs, and favorable government policy to foster investment and development.

Product Selection

To be selected, a product must have a large enough U.S. market to handle a substantial increase in imports. The size of the U.S. market was defined to include total domestic U.S. consumption, and was calculated as total shipments from U.S. producers plus total imports into the United States minus total exports out of the United States.

Growth in per capita consumption was the primary variable for selection, once a market was determined to be of ample size. Growth of each product's per capita U.S. consumption was annualized for both five-year and twenty-year periods. Generally, those products with strong upward trends in per capita growth offer the best opportunity for increased sales in the United States for both domestic producers and importers. Figure 2 shows annual per capita consumption for each product from 1970 to 1992.

The market value of the commodity relative to the cost of shipping to the United States essentially serves as a screen for determining the profitability of exporting to the United States. A low ratio implies that transportation costs consume a large portion of the product value. The likelihood of earning an average profit is probably quite low once one accounts for production costs. For the purposes of this study, a commodity's price-to-weight ratio best approximates the market-value-to-shipping-costs ratio.

Commodities that received support from government promotion programs and/or international agricultural research and extension programs were also considered to have high growth potential. By offering production incentives such as free or reduced-cost inputs and free technical knowledge, these projects and programs improve the growers' profitability. In most cases, the resources these institutions provide are targeted at projects believed to have the best opportunity for generating exports. For example, USAID projects in the 1970s and the mid-1980s in Guatemala are cited as catalysts for current large volumes of exports in fruits and vegetables.

An additional consideration was the presence of current research that might affect production costs and supply in the future. The expectation is that breakthroughs in technology in a particular country might sufficiently alter the comparative-advantage balance to affect future trade flows.

The current research involving tomato ripening serves to illustrate this point. To be marketable in the United States, tomatoes imported from South America have to be picked when they are still green so that they do not spoil by the time they reach the consumer. Because the main tomato producing region in Mexico is close to several large U.S. markets, Mexico has been able to supply the United States with more flavorful, vine-ripened tomatoes. If countries in South America were to perfect a technology that allowed them to ship vine-ripened tomatoes to the United States, Mexico's geographical advantage might be partially or totally offset.

The last criterion mentioned was that there must be an export supply (i.e., Latin American export supply) available during the months characterized by high prices. Supplies of most of these products are seasonal in both Latin America and the United States; however, because of its location, Latin America's peak season occurs when the United States is out of season. Since the volume of domestic shipments at the peak of the U.S. season is considerably greater than volume during the remaining months, the off-season price tends to be higher. We call this period the window of opportunity for imports.

As shown in Figure 3, the window of opportunity for fresh asparagus is July through March. U.S. shipments are concentrated in the months of February through June, and nearly 80 percent of these shipments originate in California. Average grower prices over the same time form a trough, higher in February and June and lower in the intervening months. From July through January, U.S. shipments and imports are low and flat, indicating that there exists an unmet window of opportunity.

Fresh asparagus imports are available for most of the year, but are strongest from January through March, when both U.S. grower and U.S. dock prices are high. Averaged over the course of the year, imports amount to 28.7 percent of U.S. consumption. But in any given month during the window of opportunity, combined import levels and U.S. shipments do not approach the level of U.S. shipments in the last month of the season, June. Throughout the window of opportunity, U.S. dock prices slowly move downward and level out during the height of U.S. shipments. Substantial quantities of imports enter again beginning in July as the U.S. dock price begins its gradual upward climb. It is important to note that imports comprise the entire U.S. market for most of the year despite a significant 25 percent year-round tariff.

Mexico claimed 79 percent of total U.S. imports of asparagus in 1992, and is the primary supplier throughout the window described above. There are two waves of Mexican imports; the first wave, from January to April, is more significant than the second, from June to September. As Figure 3 indicates, Argentina, Chile, and Colombia may export roughly from September to December. Colombian exports

begin to enter the U.S. market as early as July. Imports of asparagus from both Argentina and Honduras increased dramatically in 1992. Guatemalan asparagus exports lag slightly behind Mexican exports, entering between June and October and again from November to January.

Windows of Opportunity: U.S. Market Demand

In the analysis that follows, we assume that demand is not seasonal. In other words, domestic consumption during the off-season would potentially be equal to consumption during in-season if supply were equal. The quantity consumed varies seasonally because supply shifts along a constant demand curve. This is supported by consumer research that showing seasonality is a relatively unimportant “valued characteristic” in the purchase of produce. If an off-season fruit or vegetable is equivalent in taste, freshness, and appearance to an in-season fruit or vegetable and is priced the same, it will sell just as well. Consumers also care little about the growing region, state, or country of the product, thus further supporting the assumption that consumption during the off-season could potentially equal in-season consumption.

For each of the eight products, the window of opportunity in the U.S. market is broadly defined as the period when U.S. shipments are low. It is assumed that imports are a close substitute for U.S. production. This assumption implies that imports face roughly the same demand function as U.S. production, and that there is a direct correspondence between import prices and U.S. grower prices.

The window of opportunity is differentiated as either an unmet or a met window of opportunity. An unmet window of opportunity is one with relatively few (or no) imports. It implies that, with the assumption above, if imports enter at a lower quantity than in-season U.S. shipments, they will command a higher price than the in-season U.S. grower price. When, during a window of opportunity, the market contains a volume of imports closer to that of in-season U.S. shipments, the window of opportunity is considered to be met. In other words, it is saturated with imports.

The distinction between these two types of windows of opportunities is important, especially for establishing the foundation for the discussion of future trade flows. In the short run, in a saturated market, a reduction in tariffs may allow a country to use a cost advantage to increase imports. If the window of opportunity is unmet, the market is not saturated and such a cost advantage is unused. In the long run, efforts to gain cost advantages by establishing and developing relevant infrastructure, funding programs to advance grower expertise, and implementing biotechnology will be more attractive if the export market is unsaturated.

Windows of opportunity are identified through the analysis of quantities and prices of U.S. shipments and imports as well as the months of availability of foreign export supply.³⁸ U.S. shipments data for fresh fruits and vegetables are used as a proxy for monthly U.S. production. It is defined as shipments from growers (or out of storage) to retail distribution centers. Except for grapes and oranges, these products have relatively short storage and transport lives. Thus, one can assume that shipments approximate monthly production and roughly approximate retail sales.³⁹ The average U.S. grower price is an average of the F.O.B. price taken at major U.S. shipping points and reflects prices received by growers for products moving from the producing area to distribution centers or storage.

For imports, total U.S. imports, and imports from the selected countries, both the foreign dock price and the U.S. dock price are considered. Total U.S. imports, as the name implies, is the sum of the selected product imports from the world to the United States. For our purposes, since we do not differentiate based on quality or consumer preferences, they are fungible with U.S. shipments. The foreign dock price is the cost of the product before it incurs exporting costs such as tariffs, custom charges, insurance, and freight. It is the most accurate measure of per-unit revenues received by foreign producers. The U.S. dock price, then, is the cost of the product when it reaches the U.S. market. Of the two import values, the U.S. dock price will serve as the point of comparison to the average U.S. grower price.

The information on Latin American supply has been compiled from various sources. We have defined the period for which a commodity can be supplied to the United States from a particular country to include the months the commodity is generally harvested and the months in which the commodity is typically exported from that country.⁴⁰

The window of opportunity analysis determines whether there is an *opportunity*. However, to gauge whether it would be *profitable* to source from Latin America during the met or unmet window of opportunity, it is necessary to understand the costs of producing the product. The production-cost analysis (discussed below) in conjunction with the window-of-opportunity discussions should identify where a profitable Latin American sourcing opportunity exists. For example, where the window of opportunity has been met, if a Latin American country has a higher total cost than the United States, there is no profit-making opportunity for the Latin American country. Where an unmet window of opportunity exists, a higher-cost Latin American producer may still find it profitable to export to the United States. The findings from both the window of opportunity and cost sections will be incorporated

into the capital flows study which examines how trade flows will respond to future projected trade liberalization.

Product-by-Product Analysis

Asparagus

Asparagus production and export require numerous resources. Asparagus production is extremely labor intensive, partially because the spears must be cut often. Well-drained, sandy loam soil and frequent irrigation are necessary inputs as well. In addition, asparagus needs to be precooled after harvest due its perishable nature. Asparagus must be transported at a cold temperature, but this must be done with precision and care because the product is also sensitive to freezing. It needs to be stored in a ventilated container to avoid toughening. If asparagus is not stored and handled in such fashion, the flavor and nutritional content may be adversely affected. Properly cared for, asparagus can survive two to three weeks in transit and storage.

Based solely on market analysis, it seems likely that asparagus imports will continue to grow. Of all the products selected for this study, asparagus has the highest price-to-weight ratio. While the most recent five-year annualized per capita growth rate shows no increase, per capita demand for asparagus since the early 1970s has been modest. In addition, there is an unmet window of opportunity for asparagus from July to March, as was discussed earlier (see Figure 3). As one might expect with an unmet window of opportunity, U.S. off-season imports of asparagus relative to total asparagus imports are an incredibly high 96 percent.

Bell Peppers

Bell peppers require special post harvest treatment in order to adequately withstand transportation to the U.S. market; they are treated with a light wax and precooled after they are picked. They suffer chilling injury if stored at less than 45 degrees Fahrenheit. Bell peppers have a two- to three-week transit and storage life.

Bell pepper market descriptors show positive signs for increasing imports into the United States. (See Table 3.) Most importantly, demand for bell peppers is strong and steady. Per capita U.S. consumption has grown at an impressive annual rate of 4.18 and 4.03 percent over the past five- and twenty-years, respectively. The price-to-weight ratio is one of the highest for the products under study.

As shown in Figure 4, the window of opportunity for bell peppers is December through March. U.S. shipments occur in sizable volumes beginning in April and continuing through November.⁴¹ Florida accounts for 46 percent of U.S. bell pepper shipments and California contributes another 30 percent. The peak Floridian shipment months are March through May, while California fills the mid- to late-summer bell pepper market with its shipments. A trough in average grower prices appears from May to October as a result of heavy U.S. shipments.

Imports are only a small fraction of U.S. shipments during the U.S. season. The bulk of the 26.6 percent selected-country import share of U.S. consumption comes during the window of opportunity, implying that it has already been met. U.S. off-season imports constitute 76 percent of total U.S. imports. Mexico, which accounts for 88 percent of total U.S. bell pepper imports, ships its bell peppers to the United States. from December to April, when average U.S. grower prices are at their highest. Since Mexico and most of Latin America qualify for duty-free status either under the Caribbean Basin Initiative or the Generalized System of Preferences, removing tariffs will not provide a cost advantage to any country that does not already have one.⁴²

Many other Latin American countries could export to the United States at some point during the window of opportunity described above. Both Guatemala and Honduras exported to the United States in the past four years. As for Argentina and Colombia, both produce and have the ability to export very early in the winter, but have not done so. As for Chile, it is assumed that the Chilean harvest season for bell peppers is similar to that of other vegetables with similar growing requirements and known harvest/export seasons. Given this assumption, supply would then be available to export to the United States from Chile during the window of opportunity.

Cantaloupes

Cantaloupes can be severely damaged by excessive irrigation or rainfall anytime during the week prior to picking. Once picked, cantaloupes must be hot-water dipped and precooled. Such handling techniques reduce decay. In addition, freezing must be avoided. Depending on ripeness, cantaloupes can be stored from five to fifteen days.

Although cantaloupes have a low price-to-weight ratio, other issues justify their inclusion in the current study. The primary rationale is that production in the United States is constrained to certain months, leaving a sizable window of opportunity. With regard to market demand, per capita

consumption has shown strong upward movement in the long run, although it has grown at a more modest 1.85 percent annually over the past five years.

As shown in Figure 5, the window of opportunity for cantaloupes is November to May. In the United States, shipments of cantaloupes begin in May and taper off in November. California, Texas, and Arizona account for 50, 25, and 18 percent, respectively. All of these shipments fall between May and November, but the height of shipment activity occurs in mid-summer. Because the Westside district of California—the major cantaloupe-producing area in the United States—stopped reporting shipments in the mid-1980s, Figure 5 is not completely accurate. Extrapolating from the 1989 data, shipments in the months of October and November should be nearly twice the level presented in the graph.

The window of opportunity is partially met by current imports. While the selected countries' import share of U.S. consumption is substantial, there is room for expansion. Except for April and May, imports are usually one-half of U.S. shipments. Mexico, the largest domestic supplier of cantaloupes, exported 2,356,000 hundredweight (cwt) in 1992. These imports begin entering The U.S. market in November, reach their highest volume between March and May, and then decrease sharply between June and July. Import prices are fairly level from December to May, ranging from \$.17 to \$.20 per pound. A 35 percent tariff applies to all countries that participate in the Generalized System of Preferences (GSP), the Caribbean Basin Economic Recovery Act (CBERA), and the Andean Trade Preference Act (ACTPA). This tariff boosts the foreign dock price year round, except for the period between August 1 and September 15. Presumably, the gradual elimination of the tariff would encourage present importers to increase cantaloupe exports to the United States and possibly give some countries a cost advantage over U.S. producers.

Honduras, the second largest exporter of cantaloupes to the United States, shipped 975,000 cwt., or about 20 percent, of total imports. Guatemala, which has half as much acreage as Honduras devoted to producing cantaloupes for export, exported 621,000 cwt. to the United States⁴³ Both of these countries have available supply during the entire window of opportunity. Chile and Argentina both produce around 2 million cwt of cantaloupes, but only Chile has exported to the United States in the recent past. Chile and Colombia could possibly export during the U.S. winter while exports from Argentina would probably hit the United States in early spring.

Cucumbers

Cucumbers are treated to handling techniques such as waxing and fungicide application. In addition, they are precooled after they are picked. Cucumbers must be stored in areas over 55 degrees Fahrenheit or they will suffer from chilling injury. Cucumbers can be stored and transported for ten to fourteen days.

In terms of encouraging market descriptors, cucumbers rank in the middle of the group of eight commodities selected. They have enjoyed moderate per capita growth over 20 years, but the five-year trend is weak. With respect to other fruits and vegetables, cucumbers have a modest price-to-weight ratio.

As shown in Figure 6, the window of opportunity for cucumbers is conservatively estimated as the period between December and March. While cucumbers are produced commercially in a large number of states, Florida is the leading shipper of cucumbers. With its climate, Florida is able to produce cucumbers two times per year. The main Floridian harvest, which begins in March, overlaps with the California harvest, spanning May to October.⁴⁴ Florida's less-substantial second harvest commences in October and lasts until December. As expected, the series of U.S. average-grower prices is clearly concave between April and December, when there are substantial U.S. shipments.

While there is a considerable window of opportunity for cucumbers, it has already been met with imports from Mexico and, to a lesser extent, Honduras. These two countries constitute nearly all of the 40.1 percent of the selected countries' import share of U.S. consumption. Mexico, which alone comprised 87 percent of total U.S. imports in 1992, begins shipping cucumbers in December when Florida production slows, and continues shipping through April. Honduran imports comprise 6 percent of U.S. imports. When U.S. shipments are low (in the period from December to March), the domestic dock price is higher than the average grower price from April to November, when U.S. shipments are voluminous. Yet, as indicated by the 68.7 percent of total imports entering in the off-season, more than 30 percent of cucumber imports compete against domestic production.

Of the few South American countries that produce cucumbers, Chile represents 56 percent of total South American production, but exports fewer than 3,000 cwt. in any given year to the United States. However, it does have the potential to supply the United States during the window of opportunity, assuming that the Chilean harvest season for cucumbers is similar to that of other vegetables with similar growing requirements and known harvest/export seasons. Guatemala and Honduras have long seasons

that extend beyond windows of opportunity. Argentina, on the other hand, has a season somewhat similar to the United States—production begins in the spring and continues through November.

Cucumber imports from CBERA and ATPA countries enjoy duty-free entry to U.S. market year round and, therefore, would not increase significantly if tariffs were eliminated. The same can be said for Mexico. Mexico's cucumber imports enter duty free for nine months of the year. However, since Mexico is a GSP member, its cucumber imports incur a 25 percent tariff when U.S. production is in season, which is from May 1 to June 30 and September 1 to November 30. Given that foreign dock prices are nearly identical to the U.S. average grower prices, one would not expect vastly increased imports during this period.

Grapes

Table grapes will not ripen after harvest. Precooling handling techniques are required for table grapes, while high humidity and low temperatures are necessary conditions for efficient transportation of the fruit. Temperature must be monitored carefully because grapes will freeze when the temperature reaches negative one degree Celsius. Table grapes have relatively long storage lives in comparison to other produce. They can be stored and transported for approximately one to six months.

In terms of economic indicators of current and future growth rates, per capita consumption of grapes has fallen in the last five years. However, this may be a short-term aberration; grape exports have exhibited significant growth rates over the last 20 years. Grapes possess a modest price-to-weight ratio.

As shown in Figure 7, the window of opportunity for fresh table grapes is November through April. Domestic shipments usually extend one month beyond the production season of May to October because of grapes' lengthy storage and shelf life. Average grower prices are highest when the first U.S. shipments hit the market in May, but then decline in the early summer. Prices hold steady through the rest of the season and end slightly higher in December.

Imports heavily outweigh U.S. shipments in the window of opportunity described above, yet the window is not entirely saturated. Even though selected countries' import share of U.S. consumption seems high, it could be even larger given that imports are, on average, about half the in-season U.S. shipment average. Chilean supplies, which represent virtually the entire U.S. table grape import market (87 percent of the total U.S. table grape imports), begin arriving in November and December just as the supply of cold-stored domestic grapes is exhausted. From December through April, Chile exclusively supplies the U.S. market. Import prices start moving upward beginning in October and, excluding the

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months of June and July when exports are limited, peak in November. However, the U.S. dock price between the months of October and June is generally higher than the in-season U.S. average grower price. Most imports enter when the highest tariffs apply (\$2.12/cu. meter), adding a thick layer of costs to the foreign dock price.

Most Mexican imports arrive in May, June, and July and supplement the initial southern and central Californian harvest. Despite being one of the smaller Latin American producers, Mexico is the second largest exporter of grapes to the U.S., behind Chile. These imports enter during the duty free period from April 1 to June 30. Because Mexican imports usually enter when there are no tariffs and when there is heavy U.S. production, the U.S. dock price more closely resembles U.S. average grower prices.

In Latin America, Argentina, Chile, and Brazil are the leading grape producers. Argentina produces more than half of South America's harvest, but does not export consistently to the United States because of quality problems. Similarly, Brazil accounts for a substantial amount of the remaining South American grape harvest and has not been a consistent or significant supplier of table grapes to the United States.

Oranges

Proper handling of oranges includes waxing, applying fungicides to limit decay, and treatment with ethylene for degreening. Storage and transportation may take three to eight weeks for California- and Arizona-grown oranges and eight to twelve weeks for oranges produced in Florida and Texas.

Although oranges have low price-weight ratios and per capita consumption has fallen in the last five years, at least one very significant issue justifies their inclusion in the study. A vast amount of resources allocated to fruit and vegetable biotechnology research in the United States and Latin America has been steered towards altering undesirable traits in oranges. Therefore, oranges have been included in this study because biotechnology promises to alter the current configuration of trade.

As seen in Figure 8, there is no current window of opportunity for oranges. U.S. shipments from the Californian orange harvest supply the market from November to June, as do Arizona and Florida shipments. And since oranges can be stored for such a long time, built-up supply can cover demand during most points in the year when production slows or ceases.

With the exception of 1991, when a substantial portion of the orange crop was destroyed by frost, the import share of U.S. consumption has not exceeded .8 percent in the past four years. In 1992, the

selected countries accounted for a mere .1 percent of total domestic consumption, all of which was covered by Mexican imports.

Nearly every country in South America produces oranges; Brazil alone produces 88 percent of all South American oranges. Behind Brazil, the second largest orange producer in South America is Argentina which, like Brazil, has not exported fresh oranges to the United States during the past five years.

Strawberries

Strawberry production requires capital, quality water, and skilled management. Further increases in Latin American production could occur with increased investment in these areas. For virtually all varieties, exposure to more than 400 parts per million of salt damages the plant. Day-neutral variety strawberries do not respond to day length and will continue to produce flowers all year round as long as temperatures remain below 75 degrees. In terms of handling characteristics, strawberries must be cooled within two hours of being picked in order to maintain their quality. In addition, harvested strawberries are covered with a plastic bag and a modified atmosphere of elevated carbon dioxide is applied. Strawberries are sensitive to freezing, but must stay relatively cool to avoid rotting. Under these conditions, the combined transport and storage life for fresh strawberries is five to seven days.

As seen in Figure 9, the window of opportunity for strawberries is November to March. Of all fresh strawberries shipped in the United States, 75 percent originate in California. The winter harvest seasons in southern California and Florida roughly follow each other. Florida begins shipping in December and ends in March while southern California sends out its first large shipment of the year in February. The last large southern Californian shipment occurs usually in May, just as central California production increases. Central California shipments occur for the remainder of the year. U.S. average grower prices are clearly cyclical, curving downward from January to March and then remaining low through the summer until moving upward in September.

Imports are negligible when U.S. shipments are lowest, indicating an unmet window of opportunity. Additionally, the selected countries' import share of U.S. consumption is a low 2.7 percent. Moving south from California, strawberry harvests occur later in the year. Mexican imports begin arriving in November and continue until June. They peak in March and April, but are too small to be a significant portion of the market. Guatemala and Colombia both export an equivalent quantity of strawberries to the United States, mainly from November to January. In general, production of

strawberries in Latin America is limited. In 1991, all South American production amounted to 19 percent of that in the United States. Both Argentina and Chile have moderate production capacity, but only Chile exports on a yearly basis. Since the selected countries qualify under one of the three classifications granting duty-free privileges, tariffs do not shift the United States dock prices. Any increase in imports to the U.S. must come from efforts to improve cost advantages over the United States and from extended storage life.

Tomatoes

Tomatoes must be precooled when picked from the vine. Temperature is not a major factor in the handling of tomatoes; they are best stored at 65 to 72 degrees Fahrenheit for mature green tomatoes and 55 to 60 degrees Fahrenheit when they are ripe. But, if tomatoes have been damaged by freezing, they will be water soaked and soft upon thawing. Storage and transport timing is one to three weeks for mature, green tomatoes and four to seven days for firm-ripe tomatoes. In addition, tomatoes can be treated with ethylene for rapid and uniform ripening. These techniques are important because tomato imports must meet grade, weight, and size requirements to comply with marketing orders from October 10 to June 30.

Tomatoes were included in the study for two reasons. First, there is extensive, ongoing biotechnological research being conducted on tomatoes. It is worth investigating whether this research will help create an opportunity for exports. Second, while per capita tomato consumption has not been particularly impressive in the last five years, its price-to-weight measure ranks as one of the highest of the studied products.

As shown in Figure 10, there is no visible window of opportunity for tomatoes. From April to October, U.S. shipments from Florida and California dominate the market. The Californian season begins in mid-year and lasts until October. Alternately, Floridian shipments stretch from January to June and October to December. As for prices, U.S. average grower and U.S. dock prices are quite similar.

When U.S. shipments are slightly lower in January and February, imports make up about 45 percent of U.S. apparent consumption. The rest of the imports are fairly well distributed over the remaining months. Overall, the selected countries account for 13.1 percent of U.S. consumption. Mexico dominated the tomato import market in 1992 with 92 percent of all U.S. tomato imports. A reduction in tariffs would benefit Mexico since its imports fall under a \$.046 and \$.033 per kilogram duty during both March 1 to July 14 and September 1 to November 14. The foreign dock price, for the most part, is below the U.S. average grower price in these periods.

Although Brazil leads South America, with about 50 percent of the region's total tomato production, it has exported tomatoes to the United States only once since 1989. Argentina, Chile, and Colombia are the other major producers of tomatoes, representing another 37 percent of total South American production. In Central America, Guatemala and Honduras each have tomato production capacity. As of 1992, none of these Latin American countries has exported fresh tomatoes more than four times over the course of a four-year period.

Products Not Chosen

Traditional export crops with large markets such as bananas and pineapples were rejected because their markets are mature or saturated, with corresponding high and stable per capita consumption figures. Several of the products with growing but smaller markets were not studied at length due to data constraints, despite their ability to handle an increase in imports. In spite of their high price per pound, products like raspberries, blueberries and artichokes showed no clear per capita growth and had a relatively small total U.S. market with no clear growth trends.

Selected Country Characteristics: An Overview of Comparative Advantage Factors by Country

The criteria used to select the countries discussed in this study include the following: economic stability, political stability, favorable production capacity, necessary physical infrastructure for production and export, low labor costs, and favorable government policy to foster investment and development. In this section, we first give an overview of these factors and then discuss them as they relate to the selected countries.

In general, economic stability strongly influences the costs and returns on farm inputs and food products, the relative prices among these products, and the conditions for entry into trade. A stable macroeconomic environment and improvements in that environment also influence investment decisions and long-term productivity. Table 4 gives an overview of economic descriptors.

The selected countries encompass a range of economic advancement; per capita GDP is highest (\$4500) in Argentina and lowest (\$516) in Honduras. The selected countries vary in terms of the importance of the agricultural sector to the overall economic performance of the country. For example, the agricultural sector is the driving force in the Honduran economy, representing 26 percent of GDP, whereas in Mexico the agricultural sector contributes only 8.8 percent of GDP. The countries with the

lowest real per capita GDP (Colombia, Guatemala, and Honduras) have the highest agriculture percentages of GDP. These same countries have the lowest *selected product* export figures but overall their *total* agricultural exports to the United States are not significantly different from those of Chile and Argentina, two of the region's largest exporters (see Table 5).

Recall that one of the most critical factors of Latin America's comparative position vis-à-vis the United States is that it has an abundance of low-wage labor. Because labor is such a large component of the cost of fruit and vegetable production, as Table 6 clearly demonstrates, the cost of labor often accounts for any advantage one country may have over another. Labor can comprise 55 to 74 percent of the total cost of production, depending on the product and country under investigation.

Other issues upon which our selection criteria were predicated include a supply of suitable land, evidence of a climate favorable towards nontemperate fruit and vegetable production, and the existence of an adequate, basic infrastructure. In addition to favorable production capacity, a country must also have an adequate export-marketing infrastructure to ensure export of a consistently high-quality, competitively-priced product. A gauge of this export-marketing infrastructure is the amount of fruit and vegetables the country exports to the United States. Several of the countries' export industries had been dependent on one particular commodity, such as bananas or oranges, and so those countries were not chosen.

The role of the government and international organizations in developing a country's production capacity is also considered. A current and expected future emphasis by the government on increasing their country's productive capacity, through some combination of free-market initiatives and government-financed (or encouraged) reform, were accorded substantial roles in the selection process.

The countries we have chosen represent two types with respect to tariff levels, and provide a natural experiment in the effect of tariff removal and export focus. No tariff has been applied since 1984 for numerous commodities from Caribbean Basin Initiative members Guatemala and Honduras, and since 1991 for Andean Pact member Colombia. Mexico is having its tariff barriers phased out starting in 1994 under NAFTA. Argentina and Chile are GSP members, and will be included in liberalization in the coming years.

This difference among the countries allows us to examine the effect of tariff removal for Guatemala, Honduras, and Colombia. So far, the experiment seems to be working, although at a slower-than-expected pace. Since the inception of CBI several years ago, U.S. imports of 15 major fruits and vegetables from CBI member countries rose nearly 70 percent. By comparison, in the years prior to

tariff removal under the CBI, U.S. imports rose nearly 60 percent (See Figure 1). We will assess the future course of these trends when we consider the information on the other factors of comparative advantage. In particular, we will assess how the experience of these three countries serves as a model for anticipated changes in Mexico, Argentina, and Chile.

An individual country's comparative-advantage information is summarized as well by the measure of potential comparative advantage presented earlier. As we discuss each country's comparative position, we will refer to Table 7 which contains the measures, and to Table 8 and Table 9 which are indications of labor and transportation rates, respectively, in each country.

For labor costs, agriculture hourly wage rates in these countries are only a fraction of U.S. rates—ranging from 5.68 percent in Colombia to 18.17 percent in Mexico. These rates are used to derive foreign labor costs by multiplying U.S. labor costs by the appropriate fraction. (See Appendix 2).

The cost of transporting most products from the foreign country to the United States is a weighted average of insurance, freight, and additional international charges other than import duties.⁴⁵ These estimates are derived from 1992 Free Along Side (FAS) and Cost, Insurance, Freight (CIF) values collected by the U.S. Department of Commerce, Bureau of the Census, Foreign Trade Division.⁴⁶ (See Appendix 3.)

The weighted-average transportation estimate accounts for the fact that freight rates often vary by season and by mode of transportation. As one would expect, the rates for more perishable products such as strawberries and asparagus are substantially higher across all countries, except perhaps for Mexico because some of the growing region is only a couple of hours from the U.S. border. The higher rate reflects the greater cost of maintaining necessary transport conditions. For the more perishable commodities such as strawberries, a relatively high percentage of imports is transported by air, a costlier transportation method than standard ocean freight. Additionally, freight charges are mainly quoted by volume and not weight; some perishable commodities require special packaging that decreases the product's density per shipping container, consequently increasing the per-pound transportation rate.

Country-Specific Analysis

Argentina

Agriculture represents approximately 38 percent of Argentina's GDP and employs 12 percent of the labor force. The agriculture sector has consistently been of critical importance to the Argentinean

economy, but there have been changes in the relative importance of the commodities traded. As a temperate climate country, Argentina produces, exports, and imports many of the same crops as the United States. Argentina is a major exporter of wheat, corn, sorghum, soybeans, oilseed by-products, and livestock products, primarily beef and sheep. Horticultural exports include citrus fruit, deciduous fruit, and canned deciduous fruit. Exports of agricultural products comprise about two-thirds of all exports and are valued at approximately \$7.5 billion. Deciduous fruit and citrus products are being produced in greater quantities, and fresh fruit and juice exports are increasing. The trend toward economic deregulation and the interest in nontraditional agricultural products are growing and should facilitate expansion of nontraditional agriculture in outlying areas.

Economic Policy and Trade Liberalization. The Argentine government is attempting to maintain strict fiscal and monetary policies as part of President Menem's structural reform programs. However, these reforms are in an early stage and inflation is threatening to undermine economic discipline. In addition, the government is experiencing significant credibility problems, and Menem's commitment to democracy has come under increasing scrutiny despite promises for constitutional reforms.

Menem's wide-ranging reform program includes, most notably, a Convertibility Law, which places greater emphasis on fiscal discipline and introduces an exchange rate tightly linked to the U.S. dollar. Investment growth in Argentina is recovering after falling steeply during the hyperinflationary crisis of 1989 and 1990. Investment grew 31 percent in 1992, and the government has taken steps to secure greater capital inflows. For example, Menem recently removed the tariff on foreign capital goods and eliminated the 10 percent statistical tax on such goods. Furthermore, the government's recent privatization of the state oil company, YPF, is a clear indicator of its commitment to economic reform and to an improved foreign investment climate.

Argentina is improving its reputation among international investors and creditors in two ways. First, Argentina is servicing its external debt obligations with the international financial institutions. Second, its external debt obligations are being managed via reschedulings and partial payments. In 1992, Argentina had approximately \$62 billion in external debt, including a \$25 billion principle in outstanding commercial bank debt.

Inflation is constantly putting a strain on the Argentine economy and the fixed exchange rate. Inflationary pressures are largely due to high consumption growth (10.8 percent in 1992) and, to a lesser degree, increasing capital flows. Consumption accounted for 83 percent of GDP growth in 1992, apparently due to a renewed availability of credit as well as improving economic expectations. As a

result of this consumption-driven growth, Argentina's external current account was a negative \$8.5 billion in 1992.

Agriculture Policy. Argentina's reform policies should significantly increase production and exports. Currently Argentina maintains a large agricultural trade surplus and is a surplus producer in some commodities and self-sufficient in many others. Agricultural exports in 1990 were valued at \$7.5 billion, and imports were estimated at \$215 million. Argentina's exports to the United States were valued at approximately \$372 million in 1990. The leading Argentine exports to the United States include beef, fruit and fruit juices, sugar, vegetables, dairy products, and tobacco.

Years of economic instability and import-substitution policies have left the Argentine agricultural sector undercapitalized, with a general lack of infrastructure, services, and rural development. Historically, Argentina has maintained protectionist agricultural policies through high tariff barriers, inspection fees, and various registration systems. In 1991 in an effort to revitalize its agriculture sector the Argentine government unveiled *Reconversion Productiva* (Productive Restructuring), an agenda that attempts to address farmers' complaints and revitalize the country's agriculture sector. The most significant aspect of the program is that for a conglomeration of private banks offered \$1 billion of fresh credit lines to agricultural producers.⁴⁷ Credit will be directed to small farmers for financing the first 80 hectares of planting.

Due to increasing trade liberalization, Argentina now has very few export-promotion programs for agricultural commodities. One program that does exist is a differential export tax system that effectively promotes internal processing of raw materials. Such reforms include the elimination of agencies that regulated sugar, meat, and grain trades, as well as the privatization of government-owned grain elevators. In addition, a 3 percent reimbursement on primary-product exports has been instituted.

The relative importance of Argentina's major crop exports is likely to remain constant over the next few years. Although Argentina is a major fruit exporter, and exports more pears and almost as many apples as Chile, Chile's overall fruit exports are more than double those of Argentina. The quantity of imported produce in Argentina's domestic supermarkets indicates that Argentinean producers have failed to meet domestic demands. However, any shift from low-margin commodity crops, such as wheat and soybeans, to higher-value, capital- and technology-intensive products such as exotic fruits and vegetables will be difficult. A tough economic climate in recent years has caused investments in agriculture to decline seriously, and new investments are badly needed. In addition, farmers need to

adopt modern farming and management techniques, including the use of commodity futures markets to mitigate price fluctuations.

Infrastructure. The area near the Andes mountain range in the western region of the country, including the western regions of Mendoza, Neuquen, Salta, Tucuman, Litoral, and Valle Rio Negro, has fruit producing capabilities. However, it appears that agricultural production has been constrained by high transportation costs and the lack of basic necessities, including electricity and adequate port facilities. The more successful firms control almost all activities from production to exporting. Export marketing may benefit from a growing retail-sector demand for higher quality packaging, handling, and transport services.

The Chilean-Argentine Economic Agreement may raise Argentine fruit quality by giving Argentine fruit exporters access to improved export services such as storage and handling, as well as more efficient port operations. Signed in 1991, the trade agreement proposed to integrate the two countries' economies. The biggest obstacle to date has been the question of whether Argentina can use Chile's ports to export fresh fruit and vegetables from Western Argentina to the Pacific Rim. The agreement allows Argentina to transport its products through Chile to the Chilean ports only if the products meet Chilean phytosanitary requirements. But achieving Chile's phytosanitary level could be a costly process for Argentina. It is uncertain whether Argentina's politicians and private sector are willing to bear the costs associated with rectifying pest and disease problems that infest some Argentinean fruits and vegetables.

Current State of Technology. Argentina created a coherent national biotechnology policy in 1982 with the inception of the National Programme of Biotechnology. But, at present there is no specific legislation covering biotechnology. In general, it is expected that government financial contributions to the field will remain low.

Measure of Comparative Advantage. The Argentine labor rate is 13 percent of the U.S. rate and is the median rate among the selected countries. Transportation from Argentina is generally higher than from the other Latin American countries, as one may expect given its distance from the United States. The net effect of these costs is that only two commodities—both very labor intensive—have notable measures of comparative advantage. In the case of tomatoes, a low transportation rate would not substantially increase the advantage that Argentine labor could hold over U.S. production. Argentina is more likely to export to the United States in early spring than during the winter. Under ideal circumstances, it would still be more expensive to source from Argentina than Mexico, a major source of

competition for late-winter and early-spring tomatoes. While the measure of comparative advantage for asparagus is even lower, imports into the United States have risen each year from 100,000 pounds in 1989 to 700,000 pounds in 1992.

Chile

Fresh and processed fruit exports represent over \$1.0 billion of Chile's \$1.4 billion in agricultural exports. The share of fruit production in agricultural exports has increased significantly over the last decade. But exports of other agricultural products have also risen considerably. For example, greens and vegetables rose from \$12 million in 1983 to \$88 million in 1989. The combined value of table grapes and apple exports comprises around 40 percent of total yearly agricultural exports, and increased exports are expected to continue as recent land cultivations produce more fruit. New fruit varieties, such as the kiwi, are expected to increase their export share.⁴⁸ Furthermore, there has been significant export growth in agroindustry, such as fruit and vegetable juices and preserves, which grew to \$75 million in 1989.⁴⁹

Economic Policies and Trade Liberalization. In recent years, Chile has become one of the success stories of economic reform in Latin America. After taking power in 1990 following years of dictatorship, the democratic government emphasized economic measures that would successfully integrate Chile into the world economy. These economic reforms have produced a stable economic and political environment which has been viewed as one the most attractive markets in Latin America. For example, Chile recently restructured its debt maturities on commercial terms and, shortly thereafter, obtained a \$200 million Eurobond issue that was subscribed by many of the world's largest banks. The economy attracts over \$1 billion per year in foreign investment.

Chile's external debt burden is approximately \$18.4 billion. The Chilean government has negotiated favorable reschedulings of its debt with creditor banks and, partly as a result, the value of its debt traded on secondary markets has climbed in recent years to sell for around 90 cents on the dollar.

Chile uses a crawling peg system to determine its official exchange rate, with parallel market and interbank rates floating freely within a specified range. Generally, the Chilean government does not interfere in markets or maintain pricing support policies, and relatively few import barriers are erected. One exception is the import price band system for certain agricultural commodities, such as wheat, vegetable oils, and sugar. The government does not offer any support to exporters, aside from simplified paperwork requirements and, in the case of small, nontraditional exporters, a simplified duty drawback

system. But, the duty drawback benefits have been determined countervailable under U.S. countervailing duty law.

The Chilean government planned to stimulate continued growth by increasing exports. Between 1990 and 1994, the government aimed to increase exports from 30 percent of GDP to 35 percent, which, given GDP growth of 5 percent per year, would translate into an increase in exports of more than 40 percent.⁵⁰ Chile has recently signed or is developing free trade agreements with Mexico, Venezuela, Colombia, and Bolivia. Expansion in nontraditional exports will rely to a large extent on foreign direct investment through Decree Law 600, which guarantees national treatment to foreign investors, and on debt-equity swaps. In 1989, foreign direct investment was 6 percent of GDP, at that time the largest percentage in Latin America. Most investment in the past went to mining, agriculture, and forestry, although industry and services were gaining an increasing share. However, foreign investment in the Chilean agricultural sector, particularly in export companies, increased significantly after 1982, when the government began using debt-equity swaps to reduce foreign debt.

Keys to Chile's Agricultural Success. Chilean agriculture, particularly in fruit products, has become one of the fastest growing sectors in the economy due to constant government support, the availability of export markets, and multinational investments in both production and commercialization of the products. Other key factors to Chile's agricultural growth have been the high utilization of production inputs and increased use of high-yield varieties.⁵¹

Favorable government policies and free market forces have been instrumental in doubling Chilean agricultural production over the past ten years.⁵² In the mid-to-late 1980s, the Chilean fruit sector experienced a boom which led it to become the largest Southern Hemisphere temperate fruit supplier and the world's leading exporter of table grapes. Between 1980 and 1989, increases in Chile's fruit plantings, production, and export volume were 102, 154, and 308 percent, respectively, indicating that significant gains were achieved both in production yields and in the proportion of the crop that is of exportable quality.⁵³ Recent expansion of nontraditional agricultural exports has been extraordinary. Since the 1980s, Chile has become a net exporter of agricultural exports. Chile also enjoys a comparative advantage in Mediterranean fruit produced during the European and North American winter season.

Apples and table grapes account for the largest share of Chile's fruit exports, although recent growth has been achieved in the export of pears, nectarines, plums, peaches, and kiwifruit. Chile's labor costs are only one-third to one-fourth of those prevailing in New Zealand and Australia, and Chilean fruit

production has remained profitable despite a reduction in real prices, which has led to the downfall of orchards in the other two countries. The decline in prices, largely a result of Chile's greatly expanded exports, will make it more difficult for other countries to enter these markets. In addition to partial crop diversification, Chile has moved to diversify the planted varieties of table grapes and apples in order to extend the export marketing seasons for both commodities. While basing their early expansion on table grape exports to the U.S. market, Chilean exporters have successfully penetrated additional markets, each possessing different tastes, quality requirements, and commercial practices. New market outlets have been developed in Europe, the Middle East, the Far East, and Latin America. Expanded grape production has also given rise to a booming wine production and export industry.

The growth rate in Chilean exports may moderate in the future as world supply continues to grow. The rate of increase of fresh fruit production and export slowed in the first nine months of the 1993 season; fruit exports were down 7.2 percent while vegetable exports decreased 5.8 percent.⁵⁴

Chilean producers have succeeded and are currently finding ways to remain profitable. They have discovered and have begun to exploit niche markets. In addition to placing emphasis on improving quality, producers have introduced new varieties of existing export products to world markets.

Agricultural Policies

Chile's success in agricultural exports can be attributed partly to socio-political factors such as low labor costs, government stability and legitimacy (which provide price and cost guarantees to the agricultural economy), land tenure stability, and favorable social policies with respect to the rural poor. The quality and quantity of Chilean investment in human capital is high relative to other Latin American countries, and the rate of return on investment in education and training remain high. Agricultural exports also have been aided by Chile's modern banking policies, monetary reforms, devaluation of the peso, and the favorable investment climate.⁵⁵ Buying and selling in Chile is relatively easy due to a lack of bureaucratic restrictions and the easy exchange of foreign currencies.

The Chilean agricultural industry has also succeeded in part due to an advanced marketing system and extensive use of modern marketing strategies, such as advertising, service and quality control, and computer market analysis. In particular, Chileans have used computer programs to identify niche markets and trends in world trade, and have obtained important information by sharing technology with U.S. firms. The government's export organization, ProChile, has successfully identified new markets

and improved overall market access. In addition, Chile used modern market development techniques to diversify into products such as plums, cherries, pears, kiwifruit, and strawberries.⁵⁶

Government interest in the development of a more modern infrastructure has been increasing private and agency investment opportunities in the agriculture sector. For example, Decree Law 164 (1991) established private-sector bidding on public works projects under predefined concessionary terms and opened significant opportunities for investment in infrastructure. The government predicts it will spend the equivalent of \$2.3 billion on infrastructure improvements over the 1991 to 1994 period.⁵⁷ Projects include a water treatment plant in the west side of Santiago which will provide treated water for 400 hectares (1,000 acres) of agricultural land and will reduce the amount of effluent discharged into the Mapacho River.⁵⁸

In addition, Chile has been successful in receiving loans from the World Bank and Inter-American Development Bank to improve its economic infrastructure, and has convinced private enterprises to undertake public works projects. Such investment is directed towards roads, electric generation, and a tunnel that could cut an hour off travel time from the inner areas of the Andes Mountains, reducing produce transportation costs.⁵⁹

Chile is currently finalizing arrangements for private investors to begin financing projects dealing with the construction and modernization of seaport and fishing terminals. Significant private investment has already gone into a number of industry-specific seaports. Closely related to investments in seaports is the further development of Chile's maritime transportation facilities. Currently 91 percent of Chile's trade is conducted via ocean carrier. Over the last four years, Chile's National Merchant Marine invested over \$350 million in infrastructure.⁶⁰ The Chilean Government planned to auction off other public-works projects to private funders in 1994.

Historically, copper has lead all other commodities as Chile's primary export earner. As copper demand declined in the 1980s, the Chilean government sought to reduce reliance on copper exports by expanding agricultural production and policies to encourage other exports—for example, directing major expenditures for irrigation projects in the central valley, the major fruit growing region. In general, the government is not heavily involved in agricultural production, trade, or food marketing. Specifically, there are no significant agricultural production subsidies, planting programs, or price ceilings or floors,⁶¹ with the exception of an import price band system which governs the prices of wheat, vegetable oil, and sugar. As a result, agricultural growth has remained largely unconstrained by market inefficiencies caused by government interference in production and trade.

Small, nontraditional exporters would benefit from government incentive programs—in particular, the duty drawback system. This mechanism kicks back to producers 3 to 10 percent of the value of their exports—the equivalent of duties paid on imported capital used to produce the exported good. (The U.S. government has found Chile's subsidies for nontraditional exports countervailable under U.S. countervailing duty law.) The Chilean government, along with international nongovernmental organizations, supports technical assistance programs to peasants, helping rural areas reach a more productive, capitalistic-style development.

Infrastructure. Over the last decade, transportation infrastructure has improved, including new roads, ports, airport terminals, and the expansion of older production facilities. The privately owned food distribution and marketing system is relatively efficient, especially with regard to production for export markets. The older distribution and marketing system for the domestic market is less efficient, and the agricultural export sector does have some infrastructure weaknesses, such as market concentrations. For example, among 10,000 fruit producers, the four largest exporters control 43 percent of the fresh exports and 30 percent of the frozen exports.

Recently, the rate of technological change in both production and marketing has increased. While Californian technologies are still important, over the past decade Chilean universities and *Fundacion Chile* (Chile Foundation) have developed a local research capacity and are training and employing many agronomists. Marketing technologies have been upgraded with the introduction of computerized temperature controls on packing sheds, electronic sizing, and advanced cooling techniques.

The Chilean fruit industry now generates gross annual foreign exchange earnings of nearly \$700 million, provides employment for approximately 12 percent of the active labor force, and accounts for 46 percent of agricultural GDP. Its development has stimulated considerable private and public investment in storage and transport facilities, ports, airports, and communications infrastructure. It has also promoted the development of a large fruit processing industry which, in the future, may be able to take advantage of the already developed fresh produce marketing infrastructure and institutions to compete in international markets.

Chile's production and marketing system for vegetables is much less developed than that for fruit, with most production geared towards the domestic market. Production is of low-to-moderate quality and high postharvest losses occur. Chile's exports of fresh vegetables have remained small and highly variable, with periodic sales of onions, garlic, and potatoes to other Latin American markets. High air-

freight costs have prevented Chile from being competitive in the U.S. market for most perishable items, with the exception of asparagus.

Chilean agricultural exports actually act as a “season extender” for the Californian agricultural industry due to their reverse peak season. Exports from Chile in the U.S. off-season put into use many of the same preservation and distribution facilities used during the North American high season. Because this off-season activity reduces the distributor or storage facilities inactivity period, the result could be lower fixed costs per unit of fruit that could be passed along to the consumer.⁶²

Current State of Technology. Some of Chile’s most significant technological initiatives are being designed by the Ministry of Economy through its three subsidiary channels: Fontec, Fondef, and Fondecyt. Through ongoing initiatives, Chile is strengthening its industrial property legislation, achieving quality improvements, and facilitating technology transfer.⁶³

Trade Prospects with the United States. Chilean trade relations with the United States have improved over the last few years, when Chile was excluded from the Generalized System of Preferences and from OPIC’s investment insurance guarantees (reinstated in 1990). Some of the diplomatic problems with the United States were most likely resolved with the restoration of democratic rule in 1990. The Chilean government has welcomed steps towards Western Hemispheric free trade, and has indicated an interest in being included in an expanded NAFTA. However it is unclear whether Chile would first favor regional Latin American economic integration to a U.S. trade pact, such as through expansion of the Andean Pact.

One problem facing exports from Chile to the United States is marketing orders, the legal directives guaranteeing U.S. minimum standards of product quality for both domestic and imported goods. Currently these standards affect table grapes only, but there are proposals to expand quality coverage to other fruits. In the past, Chilean grapes have been rejected by the United States due to high fungicide content, and Chilean wines were withdrawn from some European markets due to high sorbitol content. The impact of these standards is limited in that they apply during the Northern Hemisphere peak season and not in the Chilean peak season, but they could eventually become a protectionist trade precedent. To remain competitive in an international market, quality standards for fruit exports are needed, but they have not been implemented due to disagreements between private and public sectors. It must be noted that, of all Latin American countries, Chile has been the most successful at disseminating knowledge about U.S. quality standards to growers and exporters.

Measure of Comparative Advantage. Chile is generally considered to have the best infrastructure in Latin America. Its efficient ports are models for other countries, but high air-freight costs on some perishable items can be a hindrance. From the comparative advantage exercise, we see that the measure for asparagus is still above one (1.31) despite a high transportation rate. But for strawberries, since most strawberries must be transported via air freight, the average transportation rate creates a meaningless measure of comparative advantage.

The statistic for grapes is not as high as one would expect for the largest off-season supplier of grapes to the United States. The Chilean agricultural wage rate (11.8 percent of the U.S. rate) is in the middle of the group of selected countries and lower than those of both Mexico and Argentina. The Chilean transportation rate for grapes is moderately higher than the rate in both of those countries. However, in Chile, more than in other Latin American countries, grapes could be quite near the best-case scenario since growers have been able to acquire necessary capital and the latest technologies to match the yields of their U.S. counterparts.

Colombia

Agriculture accounts for more than 20 percent of Colombia's GDP and has been growing at around 5 percent annually. The leading products are coffee, bananas, and tropical fruit. Other fast growing commodities include fruit juices and concentrates, winter vegetables, ornamental horticulture, seafood and aquaculture, and beef. Crops represent close to 75 percent of total agricultural output. The country is approximately 90 percent self-sufficient in food. Agricultural products represent around 40 percent of Colombia's total exports, with coffee accounting for the overwhelming majority of export earnings. Nearly 20 percent of Colombia's GDP originates from agricultural production, and the country has consistently had huge agricultural trade surpluses.

Economic and Trade Liberalization. The Colombian government initiated an economic liberalization plan, *apertura economica*, in 1990. This trade liberalization scheme was designed to eliminate the inward-looking policies of the past, eliminate biases against export-production, and stimulate investment. The first phase of the reform program replaced quantitative restrictions with tariffs, supplemented by a competitive exchange rate. The second, ongoing phase consolidates import duties into four tariff levels and will further reduce tariffs, narrowing the gap between tariffs on consumer goods and those on primary and capital goods. The ultimate goal is an average effective tariff rate of 15 percent.⁶⁴ Currently about 60 percent of all imports face tariff rates ranging from zero percent

to 15 percent. The government has also instituted a new credit program to finance import tariffs on capital goods for a period of up to three years. The reform also eliminated prior licensing requirements for 98 percent of all imports.

In addition to the trade reform program, financial sector reforms were enacted to improve resource mobilization and the efficiency of the public sector.⁶⁵ These reforms included reducing the subsidy element of direct credit, increasing foreign direct investment, privatizing recently nationalized banks, and reducing regulations that segment financial markets. In addition, reforms were aimed at lowering labor costs and reducing labor segmentation, improving railways, ports, shipping, low-income housing, and agricultural marketing, and privatization of public assets in the industrial and banking sectors.

Other legislation has resulted in the liberalization of the foreign exchange regime to a free-market exchange system. All commercial transactions are conducted at free-market rates set by financial markets. Financial sector reform has lowered barriers to entry for foreign intermediaries; foreign investors are now able to participate fully in the ownership of financial institutions. Under Conpes Resolutions 49 and 51, national treatment of foreign investment is guaranteed. The resolutions also provide that the level of allowable annual remittances, formerly limited to 25 percent of the previous year's registered capital, may equal all net profits, although the Colombian government may place restrictions on remittances if the level of international reserves falls below the equivalent of three months of imports. The government has approved regulations for the operation of country investment funds, which will allow foreign capital to be invested directly in the Colombian stock market.

In addition, direct tax incentives for investment activities were granted, and capital costs have been reduced via a provision making interest payments tax deductible. Value-added taxes have increased to compensate for the loss of tariff revenues.

The foreign exchange mechanism on sales of services is now freely determined by market forces, although the Colombian government has retained control over capital movements. With regard to foreign investment, the reforms guarantee national treatment of foreign investments, reduce transaction costs by eliminating licensing requirements, and provide that foreigners can participate fully in all economic activities.

Colombia has not renegotiated its external debt obligations, but has successfully refinanced maturing principle payments with commercial creditors. Total external debt is approximately \$16.8 billion. Although the government has maintained tight monetary policies, inflationary tendencies remain strong, primarily due to massive capital inflows following periods of high interest rates.

As a result of Colombia's economic reforms in the last few years, U.S. direct investment in Colombia has increased significantly, rising to \$201 million in 1990. Already dozens of U.S. agribusiness firms have invested, and are active, in Colombia; among them are Cargill, Chiquita Brands International, CPC International, General Food Corporation, Griffith Laboratories, Nabisco Brands Inc., Pepsico Inc., Quaker Oats Company, and Ralston Purina Company. The Colombian government is considering ratifying the MIGA convention to provide investment guarantees and has promised to follow OPIC mechanisms for guarantees and conflict resolutions. U.S. exports of agribusiness-related machinery and supplies, including food processing, agricultural equipment and machinery, and agricultural chemicals and ingredients totaled almost \$190 million in 1991.

Because Colombia is a beneficiary under the Andean Trade Preference Act, opportunities exist for increasing and diversifying agricultural exports to the United States. Since 1988, Colombian agricultural exports to the United States, excluding coffee and sugar, have grown by 8 percent annually, totaling \$842.7 million in 1991, the year in which the ATPA was enacted. The benefits of ATPA to agricultural growth in Colombia could be considerable, especially for fresh-cut flowers, pineapple, tobacco, raspberries, and tomatoes which currently enter the U.S. market duty-free.

Agricultural Policy. Colombia's varied topography and climate favor agricultural diversity. Generally, the richest lands are found in the central and western part of the country. Products include cocoa, sugar cane, melons, bananas, rice, cotton, tobacco, cassava, mangoes, and beef cattle in the tropical regions; coffee, corn, pineapples, oranges, tangerines, tomatoes, and other vegetables in the temperate regions; and wheat, barley, potatoes, flowers, pears, peaches, dairy cattle, and poultry in the colder regions. About half of Colombia's agricultural output comes from modern commercial farms with an average area of more than fifty hectares. Growers of the most important crops, including tropical fruits, are grouped in large associations and/or cooperatives. The other half of Colombia's agricultural production comes from small peasant farms (under three hectares).

Colombia began its "apertura" liberalization program in 1989. Its main features include import tariff and export subsidy reductions, virtual elimination of import-licensing requirements and foreign investment requirements, creation of a Ministry of Trade to coordinate trade policy, privatization of government-owned enterprises, and labor- and tax-law reforms. Within the process of economic reform and liberalization, the Colombian government has designed a comprehensive policy to substantially increase growth and income in the agricultural sector while reducing farm support programs and lowering import barriers.⁶⁶ In particular, the policies seek higher real income for rural populations and

better consumer supply and prices. The new policy emphasizes improvements in the following areas: domestic and international marketing, establishment of compensatory tariffs, anti-dumping regulations and price bands to protect the national industry, government investment in infrastructure, expanded technology transfer, greater generation of technology, and the transformation of credit.

Recent agricultural reforms include new credit lines and insurance for farmers against adverse climatic conditions. In addition, the government has authorized a \$120 million fund to finance a nationwide technology transfer program (PRONATTA), which is designed to provide access to new technologies in order to improve and modernize agro-industrial techniques and crop diversification. The agricultural sector as a whole, fearing economic injury from cheap imports, is largely opposed to the liberalization reforms of the economy, and growth in the agricultural sector is expected to slow slightly.⁶⁷

With regard to agricultural trade, the government's economic reforms have reduced customs barriers and tariffs on capital goods and inputs for the agricultural sector. The average total duty (tariff plus import surcharge) is currently 14 percent (reduced from the previous 25 percent). Tariffs range from 21 percent for consumer goods to 12 percent for raw materials and intermediate goods and 12 percent for capital goods. Import licensing requirements for almost all agricultural inputs and raw materials have been eliminated. Price bands have been established for certain goods (rice, sorghum, corn, wheat, barley, and soy) based on a system of variable customs tariffs and historical information on prices. Colombia imposes a 5 percent import surcharge on almost all imports and maintains cargo reserve restrictions. The government also maintains price controls on a number of items that can distort trade and hinder foreign investment, and has significant investment and market access barriers in the automotive and agricultural sectors.

The government created a rural credit fund called FINAGRO (Agricultural and Livestock Financial Fund) to provide resources that would make credit more accessible to smaller producers in agricultural and livestock production and, at the same time, would eliminate interest rate subsidies for all but the poorest farmers. In addition, PROEXPO, the export-financing fund, was recently converted into an import-export bank, and preferential rates for export financing are being phased out.

In 1991, the government instituted a four-year Agricultural Modernization and Development plan designed to scale back production of wheat, barley, black tobacco, and sisal, all of which suffer from high production costs and low yields. The plan will also eliminate subsidies for sorghum and soybeans. Other products whose future production support is in jeopardy are beef, sunflowers, sesame, cotton, rice,

forest products, and yams. On the other side of the spectrum, the products with the best growth and export potential include coffee, flowers, tropical fruit, grapes, sugar, and cocoa.⁶⁸

In 1960, the top ten percent of farms in terms of size occupied 82 percent of the farmable land. In 1988, that same ten percent only constituted 68 percent of all farmable land suggesting that the concentration of landholdings had been diluted.⁶⁹ There has also been a change in land tenure. Land share cultivated by the owner rose from 75 percent in 1960 to 87 percent in 1988. In 1976, the area financed for commercial agricultural crops was 21.4 percent of the total surface, while small farm crops accounted for the remaining 78.6 percent. In 1988, the share of modern agricultural crops rose to 52.4 percent, while the percentage of traditional crops dropped to 47.6 percent.⁷⁰

Infrastructure. The government of Colombia is aware of the country's inherent infrastructure and service limitations. Studies have shown that Colombian industrialists believe that they face a competitive disadvantage because they lack an adequate infrastructure. Specifically, improvements are needed in communications, services, transport and distribution capabilities, and port facilities. As part of the economic reforms of 1990, the government introduced a series of programs to privatize ports and railroads, demonopolize the telecommunications sector, and eliminate the state monopoly in sea freight. The rail system is currently being restructured by liquidating the national rail transport and authorizing private sector railways.⁷¹ In addition, cargo reserve requirements have been reduced, restrictions on the availability of permits to offer shipping services have been eliminated, and permits are now given to small shippers with minimum requirements. Limits on chartering activity, which were previously restricted to a percentage of tonnage capacity, have been eliminated.

New foreign investment laws permit foreign investment in public utilities (subject to prior approval of the government). Infrastructure and services such as transportation continue to present problems for commercial development. With the exception of a few major North-South corridors and the Buenaventura-Cali Highway, which is the only road giving access to the busiest seaport, roads are generally inadequate and the railway system has fallen into a state of disrepair. Ports at Santa Maria, Barranquilla, and Cartagena service the Caribbean, but none of these has a major container terminal.⁷²

Current State of Technology. The Colombian Government needs to promote "technological transfer, the creation and publication of quality standards, new market organization and collection centers, and facilitation of transactions by creating a port and warehouse infrastructure."⁷³ The amount of resources channeled to agricultural research as a percentage of agricultural GDP has declined.⁷⁴ Caja,

a Colombian government agency, is the only institution supporting growers, promoting technological change, and offering input supplies for the process of technological adaptation.

Measure of Comparative Advantage. Traditional agricultural items such as coffee, bananas, sugar, and cocoa hold limited potential for foreign investment, but represent significant opportunities as inputs to processed foods and new products. In addition, there are significant opportunities in the fastest growing agricultural subsectors, including fresh tropical fruit, juices and concentrates, beef, seafood and aquaculture, winter vegetables, and ornamental horticulture.⁷⁵

The cost advantage exercise confirms that winter vegetables and grapes could be potential export opportunities for Colombia. According to Table 8, the Colombian agricultural wage rate is one of the lowest in Latin America, but a poor infrastructure and export services counteract the advantage of low wages. Yet the measure of comparative advantage for asparagus and tomatoes is above 1. Despite the slightly low comparative advantage statistic of .9, strawberries seem to show growth. In 1988 Colombia exported only \$65,000 worth of fresh strawberries compared to \$1.2 million in 1991. This demonstrates that even if a country does not have a comparative advantage over the United States, it still may be able to serve profitably as a source of supply if there is a window of opportunity.

Guatemala

Guatemala is the most agriculturally productive country in Latin America. Agriculture is the driving force in the Guatemalan economy, accounting for about approximately 25 percent of the GNP, 75 percent of total export value, and employing 70 percent of the labor force.⁷⁶ Premium-grade coffee is the most important agricultural commodity, but Guatemala also produces a variety of other commodities including cardamom, bananas, corn, beans, and sugarcane.

In addition, the nontraditional sector is growing rapidly, particularly for fruit, vegetables, and ornamentals. Guatemala was the second largest CBI beneficiary in 1992, surpassed only by the Dominican Republic. Total U.S. horticultural imports from Guatemala in 1992, excluding bananas and plantains, were \$68.9 million.⁷⁷ Principal Guatemalan fruit and vegetable exports are broccoli, melons, Brussels sprouts, plantains, okra, berries and cashew nuts.

Economic Policy and Trade Liberalization. In the past political uncertainties in Guatemala have caused some economic problems, including a falling exchange rate, the subsequent loss of Central Bank reserves, and disinvestments in government bonds. In spite of a few political difficulties, liberalization and reform of the Guatemalan economy are continuing. In particular, considerable steps have been taken

to open the economy to increased trade and investment flows. Export taxes have been eliminated, and import duties have been considerably reduced and consolidated into a tariff band at 10 and 20 percent rates. Currently all Guatemalan imports, except those under certain incentive programs, are subject to the common external tariff of the Central American Common Market.

The government formed a trade and investment framework with the United States under the Enterprise for the Americas Initiative as a means of resolving trade and investment disputes, but which also promoted greater bilateral economic relations. In recent years, the government also created Free Trade Zones, which provide various incentives, including total exemption from import duties and customs charges. Generally, foreign investment receives national treatment and there are no present barriers to the transport and shipment of goods to and from Guatemala. Local exporters have complained about high maritime freight rates and security surcharges.

The Guatemalan government does not have rescheduling arrangements for its external debt of approximately \$2.5 billion. Price controls have virtually been eliminated and generally are set by market forces. Exceptions include subsidies to public transportation on diesel fuel.

In the past few years, economic growth was accompanied by a very slow rise in exports, which caused a current account deficit and increased the country's dependency on capital inflows. As a result, through 1993, interest rates have remained high, economic growth has been slow and inflationary pressures have subsided. Successive Guatemalan governments have promoted increased diversification of agricultural exports as a means of reducing instabilities in foreign-exchange earnings due to price fluctuations of certain major goods, such as coffee.

Agricultural Policies. Guatemala's trade policy has been relatively open in the past, and recent economic reforms have opened more opportunities for trade and investment in agriculture. For example, the government reduced inflation, stabilized the exchange rate which, increased foreign exchange reserves, and eliminated price controls on many agricultural goods. Other traditional beneficial policies have remained intact, such as tax advantages granted to agricultural cooperatives, tariff exemptions for the nontraditional export sector (including fruit, vegetables, and flowers), and pricing protection for local wheat producers. Import tariffs have been reduced, and Guatemala has become more involved in several multilateral trade agreements. Guatemala recently joined GATT, signed a framework agreement under the U.S. Enterprise for the Americas Initiative (EAI), and is planning economic integration with Honduras and El Salvador. This regional agreement would implement a harmonized variable tariff system for select basic grains and establish standardized and fixed tariffs for a variety of agricultural

products. It would also liberalize inter-regional agricultural trade between the countries; interregional trade of basic grains and other commodities would no longer be prohibited.

In early 1993, the government of Guatemala initiated the National Agricultural Commodity Exchange which will work to create and improve storage and transportation infrastructure as well as train personnel to certify the quality of the goods traded. Commodities currently traded are coffee, corn, and sesame.

Official government policy is to stimulate production in order to boost export earnings and reduce the need to import foodstuffs. The government has been relatively successful in establishing agricultural diversification to buttress export earnings against commodity-price fluctuations. It has also sought to encourage the development of processing and packaging plants in order to upgrade the value of farm exports. The production of fresh and frozen vegetables and ornamental plants has been particularly successful.

Foreign investment is encouraged and there are no legal restrictions, although investors complain of bureaucratic red tape. However, foreign participation is limited in practice by the absence of a domestic land market. Most foreign participation is concentrated in nontraditional, export-oriented crops, such as broccoli, asparagus, and a wide variety of fruits, which are exported fresh and frozen.

Diversification into export vegetables, primarily cauliflower, broccoli, snow peas, and Brussels sprouts, began in the mid-1970s, with large injections of foreign investment capital. Export vegetable production has since evolved to a system in which contracts are awarded to individual farmers, many of whom have formed cooperatives. Studies in Guatemala have shown that small farms have a comparative advantage over larger farms in export vegetable production because of high labor intensity and more efficient on-field management supervising in order to meet quality standards. These characteristics indicate sustainability of export vegetable production for small farmers and cooperatives.⁷⁸

Most of the labor force is engaged in small-scale subsistence farming (*minifundios*), but large-scale commercial agriculture (*latifundios*) accounts for the bulk of aggregate production and almost all export crops. The farm sector is characterized by wide regional diversity and a highly skewed farm-size distribution. While traditional agricultural exports, such as coffee, continue to be important, nontraditional exports particularly broccoli, cauliflower, snow peas, and fruits such as strawberries and melons present the best long-term growth prospects. In addition, prospects for investments in value-added industries such as freezing, canning, and processing are excellent.

To encourage even more nontraditional commodity production, the government has recently cleared farming restrictions on a huge tract of good quality, very rural land in southeastern Guatemala. Since growers in this area are mainly subsistence farmers, the government's ruling is seen as a means to raise income of farmers in the region.⁷⁹ Although the land has potential for nontraditional commodity export, it could take many years before this region is able to export high volumes, as all types of production and export services and facilities in the area need to be developed.

Infrastructure. The South Coast is the heart of Guatemala's commercial agriculture sector. Its development has led to one of the highest agricultural growth rates in the world. Between 1965 and 1980, agricultural production grew at an annual rate of 5.1 percent.⁸⁰ More than 80 percent of the surface area of the South Coast is classified as prime agricultural land. Land use is dominated by the production of coffee, cotton, sugarcane, and beef, which account for 90 percent of total land used. Not far from the large commercial fields on the southern coast and around Guatemala City are an increasing number of agroindustries. Land to the west and the Western Highlands are of lesser quality, yet still farmable. Ownership in the Western Highlands is less concentrated because it is farmed primarily to satisfy family consumption.⁸¹

Roads in Guatemala are in dire need of upgrading, but the government generally does not have the resources to maintain and upgrade the transportation system. The highway system, in particular, is crucial to the development of Guatemala. Presently, farmers do not have adequate access to domestic markets, and demand for secondary roads is great in all outlying agricultural areas.

The government has turned to international lending institutions and private enterprise to bring about these needed improvements. In northeastern Guatemala, the government has proposed auctioning a concession to private enterprise to construct and operate a 619-kilometer stretch of toll roads. A similar project is under discussion for the southeastern and central regions of Guatemala. In the western part of the country, the government is offering development rights for 750 kilometers of public highways.

Accompanying the growth in nontraditional commodity production has been the development of an export industry geared towards meeting the transit and storage requirements of nontraditional products. Besides the export services they offer, these marketing intermediaries are valuable for the market information they pass along from foreign buyer to producer and vice versa.

Local exporters have complained about high maritime freight rates and security surcharges. For several years, 75 percent of the cargo entering and leaving Guatemala was transported by five Central

American Liner Association (CALA) members: Sealand, Seaboard Marine, Crowley, Caribbean Transport, and Empresa Naviera Santa. The addition of two smaller lines to this market in 1990 could serve to lower transportation rates to the U.S. market.

Guatemala has one of the highest population growth and labor-force participation rates in agriculture. Both of these figures are expected to remain constant over the next two decades, ensuring a steady supply of low-priced labor. From Table 8 shows that the present agricultural wage rate is roughly 8.5 percent of the U.S. rate.

This low-cost source of labor is the primary reason that Guatemala has a ratio above one for all of the commodities except cucumbers. The asparagus measure of comparative advantage, which has the highest statistic among the seven commodities produced in Guatemala, confirms what is known about asparagus production in that country. Low wage and transportation rates, an advantageous climate, and a great deal of technical support from domestic and international institutions have helped make asparagus one of the newer commodities to contribute to the nontraditional commodity export boom in Guatemala. In 1990, virtually all asparagus production was devoted to export to the United States. Imports from Guatemala since 1989 have more than tripled to an estimated 400,000 pounds in 1993.

Honduras

Bananas and coffee still dominate the export market and account for 90 percent of traditional agricultural export earnings and 60 percent of total export earnings. Other significant traditional exports are beef, lumber, and sugar. Nontraditional exports of cultivated shrimp and melon are increasing, although export growth of other nontraditional agricultural products has been slow.⁸² In relatively little time, Honduras has become the second largest melon exporter (behind Costa Rica) in Latin America.⁸³

Economic and Trade Liberalization. Economic reform programs initiated in 1990 and 1991 included the deregulation of restrictive pricing and marketing mechanisms, trade liberalization, the removal of interest rate ceilings, reduction of the fiscal deficit, and improved cost recovery for public utilities.

Economic growth in 1993 was predicted to be strong (approximately 5 percent GDP growth), due to an increased minimum wage and higher government spending, particularly on infrastructure projects. Inflationary pressures remain strong due to increased consumer demand and a rising fiscal deficit. Pressure on the currency has also continued, and further depreciation is likely.

Honduras is under considerable pressure from its international creditors to service debt and continue fiscal and monetary reform. In particular, Honduras must satisfy the IMF demand that fiscal control be restored or risk losing disbursements from the World Bank and the IDB that are linked to the three-year Extended Structural Adjustment Fund loan from the IMF. The Honduran government has depleted its currency reserves, and continued service on external debt of approximately \$3.2 billion remains uncertain despite the need for credibility in the eyes of the IMF and other multilateral lenders.

Agricultural Policy. The agricultural sector of Honduras encompasses a diversity of microclimates and fertile valleys. Agricultural production is the driving force in the Honduran economy, representing 26 percent of GDP and about 75 percent of the export earnings. Most agricultural production comes from small producers engaged in subsistence-level farming with limited access to technology. The average farm size is 11.2 hectares, although there are exceptions in large commercial plantations of bananas, sugarcane, and African palm.⁸⁴ Less than 20 percent of the available land is cultivated, fertilizer use is largely limited to the larger producers, and productivity is low and largely dependent on rainfall and climatic conditions. Traditionally, Honduras has been the bread basket of Central America, a position it is seeking to solidify as the countries in the region strengthen their ties in a common market.

In recent years, Honduras has been striving to develop its nontraditional produce exports, including pineapples and melons. Nontraditional exports such as cultivated shrimp, African palm, and winter vegetables have been welcomed on international markets and the steadily growing manufacturing sector is prepared to lead the country into its new global role. Melon exports, in particular, are expected to increase.

Despite the growing production of fruits and vegetables, the Honduran industry for processing products is relatively underdeveloped. Most exports of fruits and vegetables are fresh products, with little or no value added. Large agricultural producers are increasingly diversifying their operations to take advantage of a relatively underdeveloped local food processing industry, an ample and growing supply of raw products, and the proximity of the U.S. market. Investments are taking place in fruit dehydration, juice extraction, fruit and vegetable freezing, and canning.

Honduran farmers are struggling to adapt to recent government reforms. In 1990, the government liberalized agricultural prices, reducing the degree of state intervention in the sector. Import duties were lowered to a maximum of 20 percent, and the import process was simplified. Producer price supports were eliminated and only four products were subject to consumer price controls: sugar, coffee, vegetable shortening, and cornstarch. As a result, prices of almost all farm products, which for nearly two decades

were maintained at very low levels in order to restrain inflation, have increased, and productivity is slowly beginning to rise. In addition, Honduras is currently in the process of implementing a price-band system for yellow corn, rice, sorghum, and soybeans to increase imports and stabilize prices.

Growth in agricultural output in recent years is the result of a push to increase exports of nontraditional products, increased use of modern farming techniques by local agricultural producers, the passage of an agricultural modernization law in 1992, and the implementation of internal and external trade liberalization measures. The Government of Honduras is solidly in favor of any effort to increase its export earnings and is supportive of efforts being made by the Foundation for Investment and Export Development (FIDE) and the Federation of Agricultural Producers and Exporters of Honduras (FPX). Both of these organizations are actively involved in attracting and developing international investment projects in Honduras.

Exporters of agricultural products enjoy an advantage in securing the foreign exchange needed to purchase required imports used in the production of their exports. Investors also enjoy a ten-year income tax holiday.

Infrastructure. With few exceptions, the 1975 Agrarian Reform law limits the amount of land individuals and corporations may own. The limit varies from 100 hectares (247 acres) to 2,000 hectares (4,942 acres), depending on location and factors such as the availability of irrigation.⁸⁵ Several restrictions exist on foreign investment in Honduras, although a new foreign investment law under consideration may reduce that number. Majority ownership must be held by Honduran nationals in several types of industries. These include beneficiaries of the National Agrarian Reform law, commercial fishing or direct exploitation of forest resources, local transportation, agents and distributors for foreign companies, and radio and television broadcasting.

Generally, the air cargo infrastructure of Honduras is in dire need of improvement, especially at regional airports where new cargo terminals and freight handling areas are lacking.⁸⁶ The Honduran government has emphasized major improvement projects for the air and land transportation systems.⁸⁷ For example, the government is converting the former military base at Palmerola into a commercial airport, which will connect a fertile central valley area to export centers in the northern and southern regions of the country. In addition, highway construction is planned between the capital and the valley area, and between the Caribbean coast and Guatemala, improving the overland transit system as well as Honduran-Guatemalan trade ties.

Measure of Comparative Advantage. Each of the six products that Honduras can produce has a comparative advantage over the U.S. This is attributable mainly to Honduras' cost of agricultural labor, which is only 6 percent of U.S. labor rates.

The bell pepper crop has the greatest advantage at 2.17. Two commodities with less convincing statistics are cantaloupes and cucumbers. Of all the nontraditional fruits and vegetables grown in Honduras, cantaloupes have the highest number of hectares devoted to production for export to the United States, and Honduras is the second largest supplier of cantaloupes to the United States. It remains to be seen how the removal of tariffs on Mexican cantaloupes entering the United States will affect Honduras' U.S. exports.

Another commodity with a favorable comparative advantage measure that may offer export opportunities is tomatoes. Low labor rates and an abundance of usable land have recently encouraged investment and expansion in the domestic tomato industry. For example, Cultivos Palmerola doubled its sown area of tomatoes to 1200 manzanas (1 manzana = 67 hectares) in 1994, increasing tonnage from 27,000 to 50,000.⁸⁸

Mexico

Agriculture accounts for approximately 9 percent of Mexico's GDP and employs about 25 percent of the labor force. Mexico is a net importer for most foods and feeds, except for horticultural and tropical products, and is the third largest trading partner of the United States. The main market for exported Mexican fruit and vegetables is the United States. Mexican vegetables accounted for 82 percent of all U.S. fresh vegetable imports in 1992.

Economic Policy and Trade Liberalization. Mexico's economic policy since 1987 has been comprised largely of a series of government-labor-private sector price and wage restraint pacts, currently known as the Pact for Stability and Economic Growth (PECE). The pacts include tight fiscal and monetary policies; price, wage, and exchange rate controls; and rapid trade liberalization. In the past years, these measures have successfully reduced inflation to moderate levels and restored economic confidence. Coupled with a wide-ranging privatization and deregulation program, the policies have promoted strong economic growth and garnered the confidence of the international economic community.

The successful completion of NAFTA has been the most publicized aspect of Mexico's trade liberalization program. In addition, Mexico joined with Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua to create a free trade zone among those countries by the end of 1996. Mexico has also

rewritten its foreign trade and investment laws, reduced the number of items subject to export taxes and controls, and expanded government programs and financial incentives to exporters. New legislation also has improved land and corporate ownership opportunities for foreigners.

The Mexican government is encouraging foreign direct investment as a further structural reform. The objective of the government is to increase significantly the level of foreign direct investment. Associated with fewer rules regarding foreign direct investment are arrangements for increasing technology transfer. New laws provide for more certainty regarding the ownership of intellectual property rights.

The Mexican government has almost completed its privatization program (which fueled a private investment growth rate of 20.4 percent in 1992). The government has divested itself of most parastatal enterprises and is promoting an ambitious program of deregulation to reduce further its role in the economy.

Mexico successfully renegotiated its external debt in 1989 and has since benefited from large capital inflows and the reopening of international credit markets to Mexican borrowers at progressively more favorable terms. In 1990, Mexico's foreign currency debt was rated favorably enough (Baa rating) to enable government borrowing on the international commercial market. Currently Mexico's external debt burden is approximately \$108 billion.

Trade barriers have been lowered or eliminated for many commodities. Since joining GATT in 1986, Mexico has reduced import tariffs from 100 percent on certain items to a maximum 20 percent across the board. Average tariffs are 10 percent. Mexico also eliminated some import license requirements, which had a significant impact on Mexican imports of agricultural commodities. Import licenses remain on corn, wheat, some fresh cheeses, eggs, poultry meat, and certain horticultural products. Licenses are required for about 40 percent of Mexico's total food imports.

Agricultural Policies and Infrastructure. In the years to come, Mexico will continue to specialize in products in which Mexican farmers have a comparative advantage, such as vegetables and tropical products. The government is hoping that increasing exports of these commodities will offset negative trade flows for products in which the country is not competitive, namely grains and grain products, oilseeds, selected livestock, and poultry.

Mexican agriculture has faced a significant reduction in the agricultural and food support budget over the last decade. In addition, funds channeled to agricultural research have been reduced from an

already inadequate level. Coupled with the fact that the domestic supply of imported agricultural capital has declined over the last ten years, Mexican agriculture is facing serious modernization problems.

Furthermore, recent policies have had a profound effect on the Mexican agricultural system. Direct and indirect subsidies have been reduced or eliminated for many commodities, and producer price supports are no longer guaranteed by the government. The exceptions are corn and dry beans which still benefit from high price supports and import controls. As a result, production has shifted from other crops to corn and dry beans. In addition, constitutional changes in land reform have redistributed land holdings to communal farmers and authorized domestic and foreign private investment in the communal farming system.⁸⁹ In 1992 further agricultural reforms were approved which initiated projects to capitalize rural areas, create new production alternatives, and support a new small-farmer movement.

However, investments in agriculture and food processing are expected to increase during the 1990s as the financial constraints of the private sector are eased. More investment should increase cropping through additional irrigated area. Productivity growth should improve gradually, as technology and increasing investment offset reduced input subsidies. Policies will gradually shift agriculture away from the production of traditional import crops toward high-value export crops, including horticultural and livestock products.

Since its accession to the GATT in 1986, Mexico has substantially reduced its tariff and nontariff barriers to trade. Nonetheless, numerous tariffs, licensing requirements, and sanitary requirements continue to be a barrier to foreign exports. Strict phytosanitary standards, occasionally imposed during peak harvest times in Mexico, inhibit agricultural exports.

Infrastructure. Mexico's agricultural sector has stagnated over the last decade and, in fact, agricultural growth has been lower than population growth over the last few years. This decline in agricultural production and farm incomes in the 1980s can be attributed partly to currency depreciation and high domestic inflation rates. More recently, severe storms and excessive rainfall have had an effect on some northern crops, and government reform programs have caused substantial changes in the agricultural sector.

Farms are generally small with limited access to technology and capital, and the sector is extremely diverse. Northern irrigated farm areas produce wheat, sorghum, oilseeds, cotton, sugarcane, vegetables, and forage crops. Central nonirrigated farms produce corn and dry beans, while irrigated farms produce feed grains, wheat, oilseeds, and vegetables. The tropical southern regions produce citrus, coffee, rice, sugarcane, and other plantation crops such as bananas, cocoa, pineapples, and vegetables.

Over the past decade Mexico has suffered a tremendous disinvestment in agriculture and the agricultural infrastructure, particularly for irrigation. For example, new land brought under irrigation in Mexico has declined from 202,800 acres in 1979 to 18,400 acres in 1990. Since only about 20 percent of the arable land is irrigated, increases in irrigated capacity are crucial to agricultural growth. This fact, coupled with inconsistent rains, indicates that arid and semi-arid land will likely continue to suffer erratic yields.⁹⁰ The use of pesticides for agriculture has also declined.

The Mexican truck transport system, which was liberalized in late 1989, is undergoing fundamental change and is not able to meet the demands of increasing trade. In particular, the lack of large freezer trailers and other specialized transport equipment is a major transportation constraint.⁹¹ The Salinas government is attempting to remedy some of the limitations on Mexico's infrastructure. For example, in 1991, 80 percent of the cargo movement in Mexico relied on road transportation, but only 40 percent of the highways were paved. Salinas initiated a major highway construction program by granting concessions to domestic and multinational private firms. By mid-1993, 400 kilometers of new roads had been built.⁹² Use of privately operated infrastructure may add to the cost of exporting. For example, on some privately owned Mexican toll roads, a 45-kilometer stretch can cost \$15. However, the cost is often negated by savings from reduced travel time. Finally, the combined effects of deregulating highway freight transportation, container shipping, and agriculture may produce some efficiencies in transportation.

Current State of Technology. Government support for research and development in agriculture in Mexico has declined since the early 1980s. Particularly troublesome is the drop in expenditures to the National Agency of Science and Technology (CONACYT), from 3 billion pesos in 1980 to 2 billion pesos in 1990. The budget administered by INIFAP, the primary government agricultural/livestock research institution was reduced by 60 percent. This disinvestment over the past decade has diminished Mexico's competitiveness.

Mexico, the largest horticultural player in the U.S. market, has a number of problems stemming from disinvestment, causing the technology gap between U.S. and Mexican growers to widen in certain areas. This gap is particularly noticeable in the Sinaloan vegetable industry. Modernization is greater in Baja, California, where relationships between Californian and Mexican growers are tighter and joint ventures are more common. Export-oriented growers in Baja generally use the same technology as those in Southern California, assisted by similar climate and growing conditions.⁹³

Table 7 demonstrates why Mexico has become the dominant foreign supplier of fresh fruit and vegetables to the U.S. market. Under the assumptions stated above, Mexico holds a significant advantage over the United States for every commodity studied. Although the Mexican wage rate is the highest of the Latin American countries, the proximity of Mexico's major growing regions to the U.S. border keeps transportation costs low and its advantage over the United States high. Table 10 shows actual Mexican costs.

Countries Not Included

In order to select suitable countries for study, all Latin American countries and the Caribbean islands that could potentially grow nontraditional commodities were analyzed. Candidates that were highly unlikely, either because of bad investment environments or small production capabilities, were eliminated. Many of the islands were ruled out due to their limited production capacities. Political or economic instability eliminated countries that otherwise seemed attractive from a production viewpoint. A brief explanation for not including those countries follows.

In Brazil, inflation rates exceeding 100 percent annually are due in large part to huge public deficits. The crowding out of private investment (both domestic and foreign sources) is the result. The arbitrary nature of an authoritarian government often leads to scant adherence to sustained market reforms and makes any investment a risky proposition. Constitutional limitations on market forces (including price setting and private-sector involvement in some sectors) forestall meaningful and lasting economic reforms.

A heavy reliance on trade taxes increases the possibility of social disruptions in Paraguay when trade restrictions are eventually lowered. This reliance, combined with a relatively weak commitment to market and political liberalization, this reliance increases the possibility that adverse macroeconomic consequences of liberalization will lead to the slowing or suspension of reform. Because of the unforeseen consequences of such reforms, the strong fiscal environment that Paraguay currently possesses would quite possibly be disrupted, with negative effects on current and future investment likely.

An external debt amounting to over 500 percent of exported goods and services makes investment in Bolivia much riskier and less likely to be profitable than in some neighboring countries. A net interest payments-to-total exports ratio of over 20 percent reinforces this scenario.

Ecuador combines both high inflation and a large external debt to display the negative aspects of both Paraguay and Bolivia. The country's relatively inefficient infrastructure makes for substantially slower market response times, leading to unacceptable risk and smaller-than-necessary profitability. With the slow implementation of a recently passed privatization law, continued government control of vital industries remains troublesome.

Peru is seriously underdeveloped, with constant economic, political, and social upheaval (the continued presence of Shining Path guerrillas is a case in point). A high interest rate–capital attraction–inflation cycle is present. As a result, lowered tariffs will lead to domestic opposition, since Peru's goods will be much more expensive than rival countries' such as Colombia and Venezuela. Total privatization was not slated to be completed before 1996 (at the earliest).

Venezuela possesses relatively strong economic factors, though high inflation and large external debt are somewhat worrisome. However, political instability will continue to threaten the viability of any agreements. Successive administrations may lead to differing adherence to and enforcement of trade policies (e.g., the recent reluctance to privatize).

An otherwise strong economic foundation is somewhat weakened by Costa Rica's heavy reliance on trade taxes (28 percent of tax revenue over last two years). Economic disruptions are likely when this revenue is eliminated, with potentially severe consequences for already-committed investors. A veritable maze of constantly changing import restrictions adds to this uncertainty.

A poor economic infrastructure and large-scale government control of industry combine to slow response and adjustment times in El Salvador, decreasing competition and innovation and leading to unnecessary investment risk. This situation is exacerbated by El Salvador's very poor record on intellectual-property protection. The existence of various price controls on imports of corn, rice, soybeans, and sorghum demonstrates the power that threatened domestic industries have over the government's trade policies.

Very high inflation, a large external debt, and poor adherence to market tenets combine with severe political and social disruptions to make Nicaragua a very big investment risk at this time. Its economic infrastructure is generally nonexistent, and will continue to be so until social and political equanimity are established.

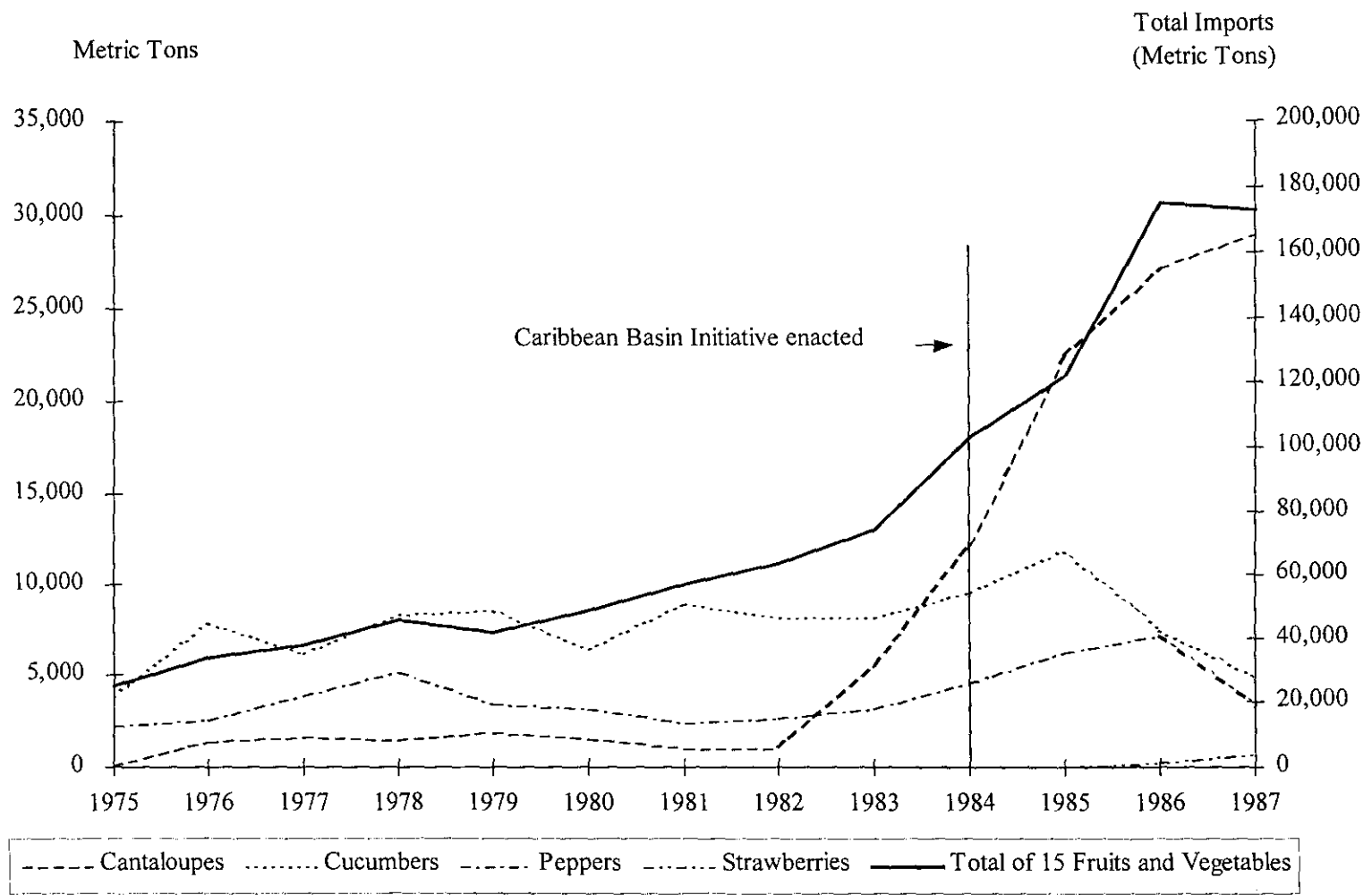
The Bahamas' heavy reliance on trade taxes (60 percent of total revenue over the last two years) and questionable commitment to market policies make its adherence to any trade agreements uncertain.

Investors need to see a decreased reliance on state control of industry (ideally codified into law) before investing. The Bahamas' relatively small production capabilities make sustained returns unlikely.

In Barbados, a questionable market orientation and somewhat heavy reliance on trade taxes are problematic. As in the Bahamas, small production capacity makes this country a short-time proposition.

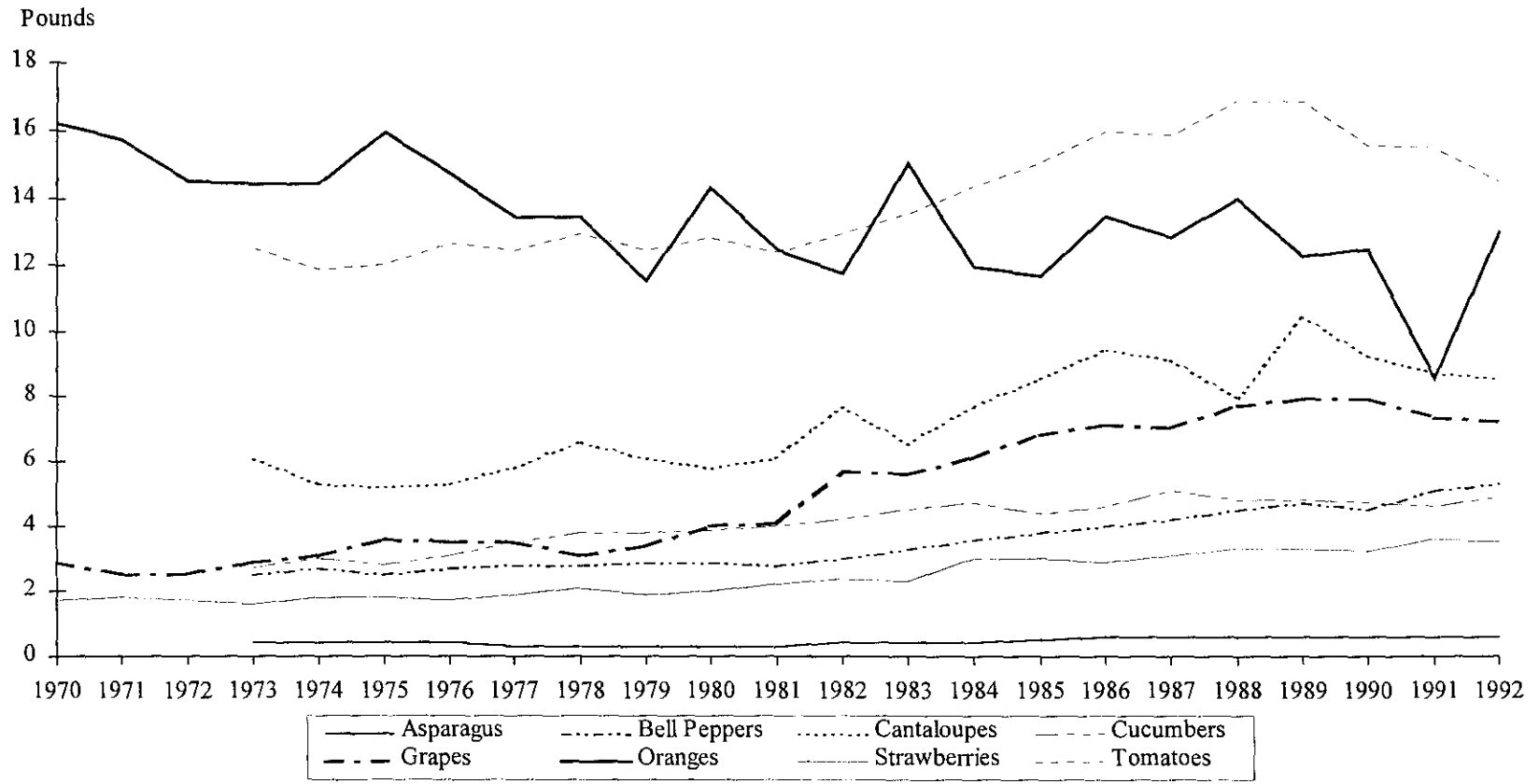
Guyana possesses a large annual debt (1990-92 deficit of 17 percent of GDP) and an external debt in 1991 which was almost 700 percent of exports. Very conservative political inclinations and political instability make this country susceptible to popular "interpretations" of any trade agreements.

Economic situations in Jamaica are nearly identical to those in Barbados. Trinidad's and Tobago's poor adherence to market-oriented policies is illustrated by their recent, weak attempts at privatization. Like the CARICOM countries, their small production capacity makes them poor long-run investment choices.



Source: Richard Brown and Nydua Suarez, U.S. Markets for Caribbean Basin Fruits and Vegetables: Selected Characteristics for 17 Fresh and Frozen Imports, 1975-1987, USDA, ERS (March 1991.)

Figure 1. Caribbean Basin fresh fruit and vegetable imports to the United States, 1975-1987.



Source: USDA, ERS, Fruit and Tree Nuts Situation and Outlook Yearbook, Vegetables, and Specialities Situation and Outlook Yearbook.
 Figure 2. U.S. per capita consumption of selected fruits and vegetables, 1970-1992

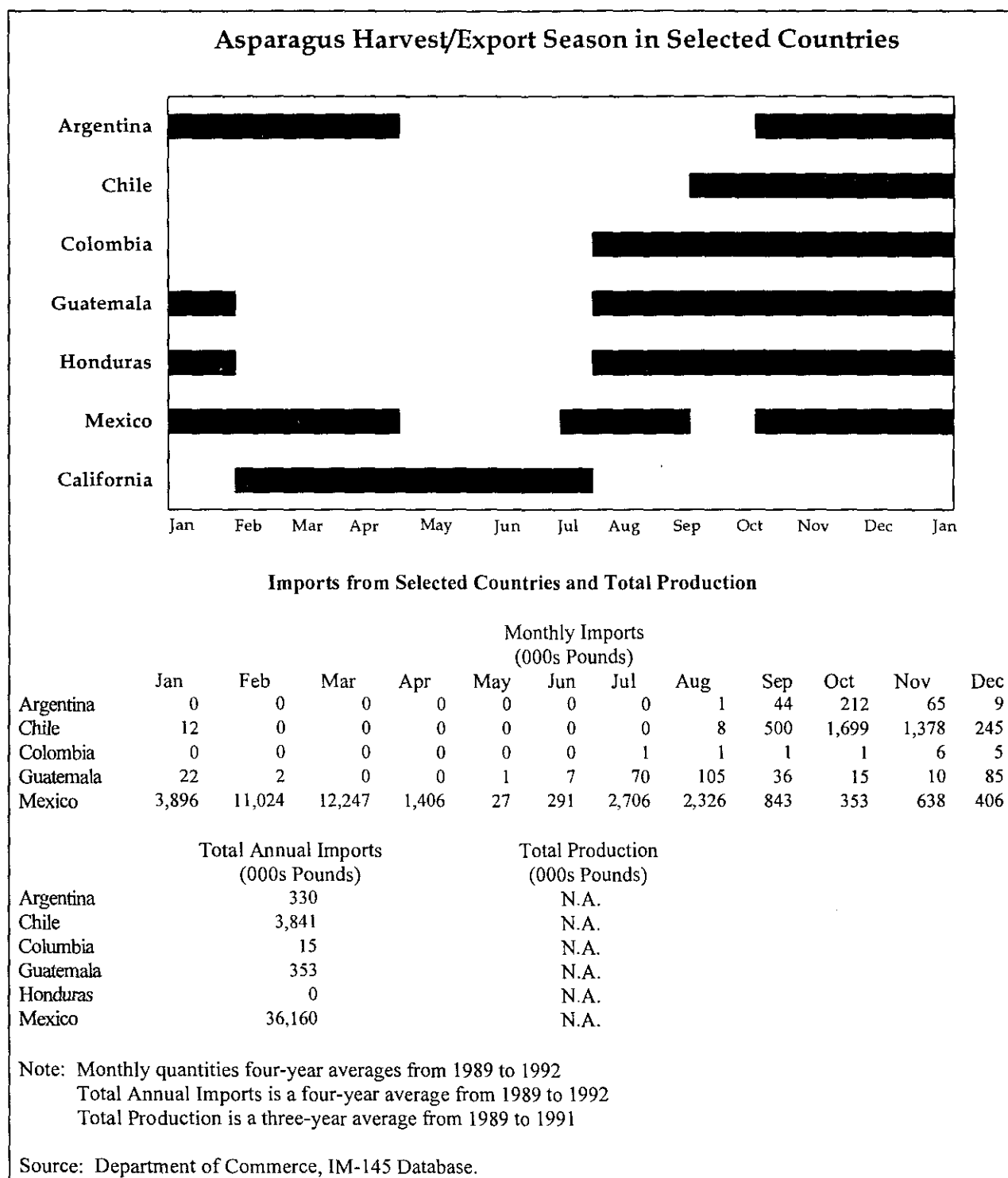
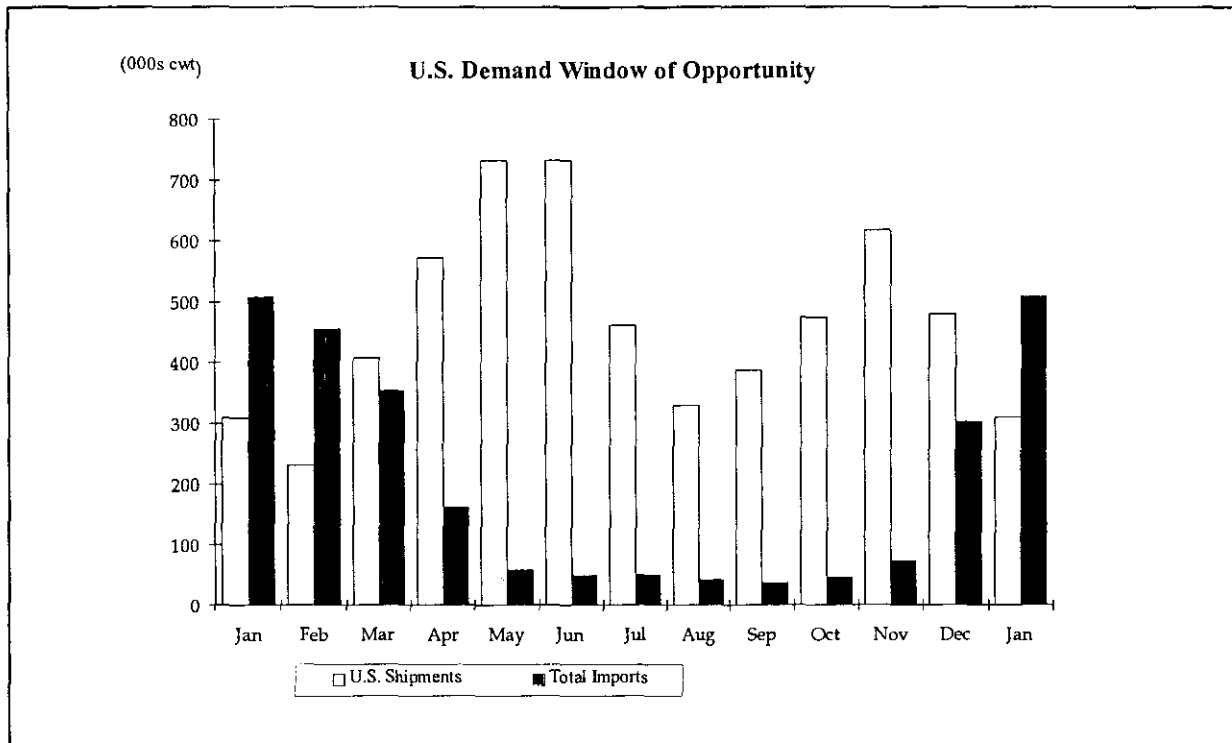
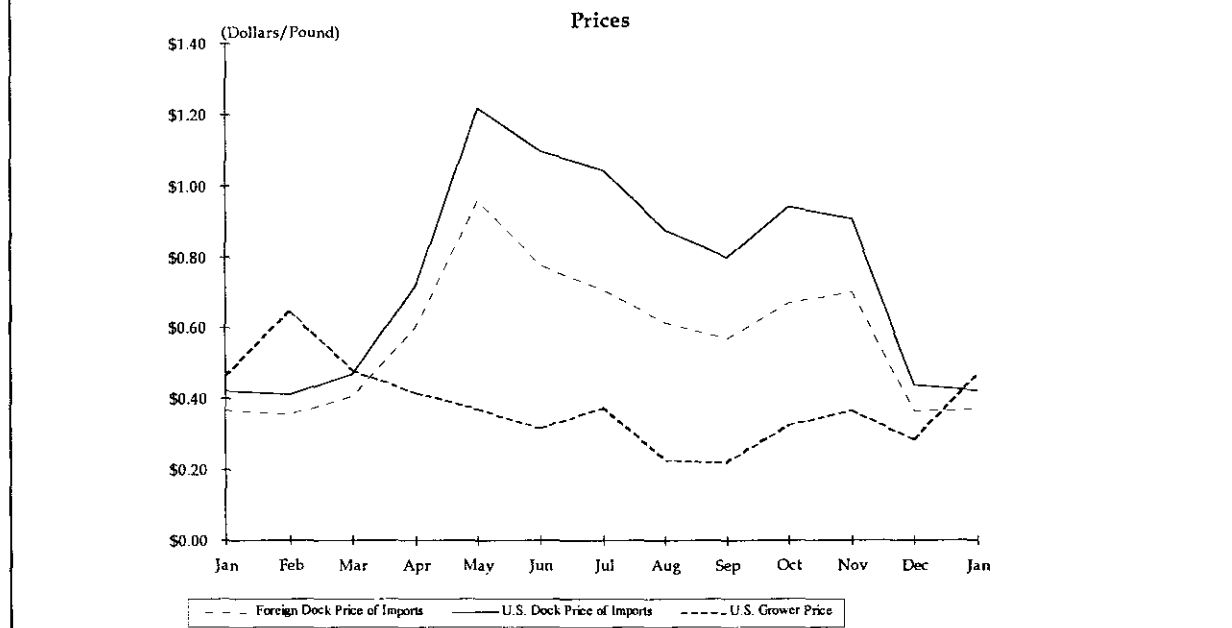


Figure 3. Asparagus Harvest/Export Season in Selected Countries



Note: Monthly quantities represent four-year averages from 1989 to 1992.
 Source: Department of Commerce, IM-145 Database and USDA FVAS-4, various years.



Note: Monthly quantities represent four-year averages from 1989 to 1992.
 Source: Department of Commerce, IM-145 Database.

Figure 4. U.S. Demand Window of Opportunity and Prices for Bell Peppers

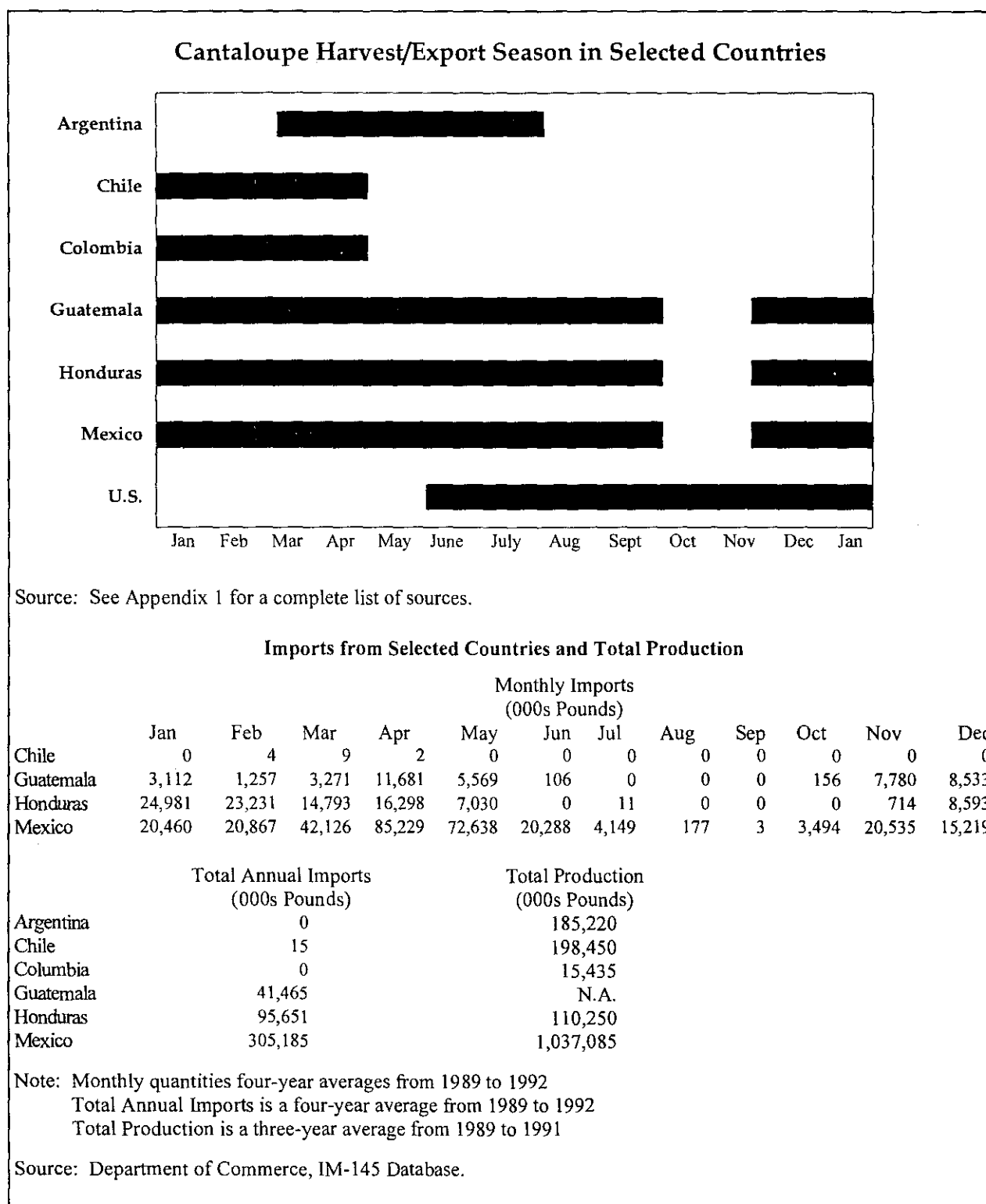
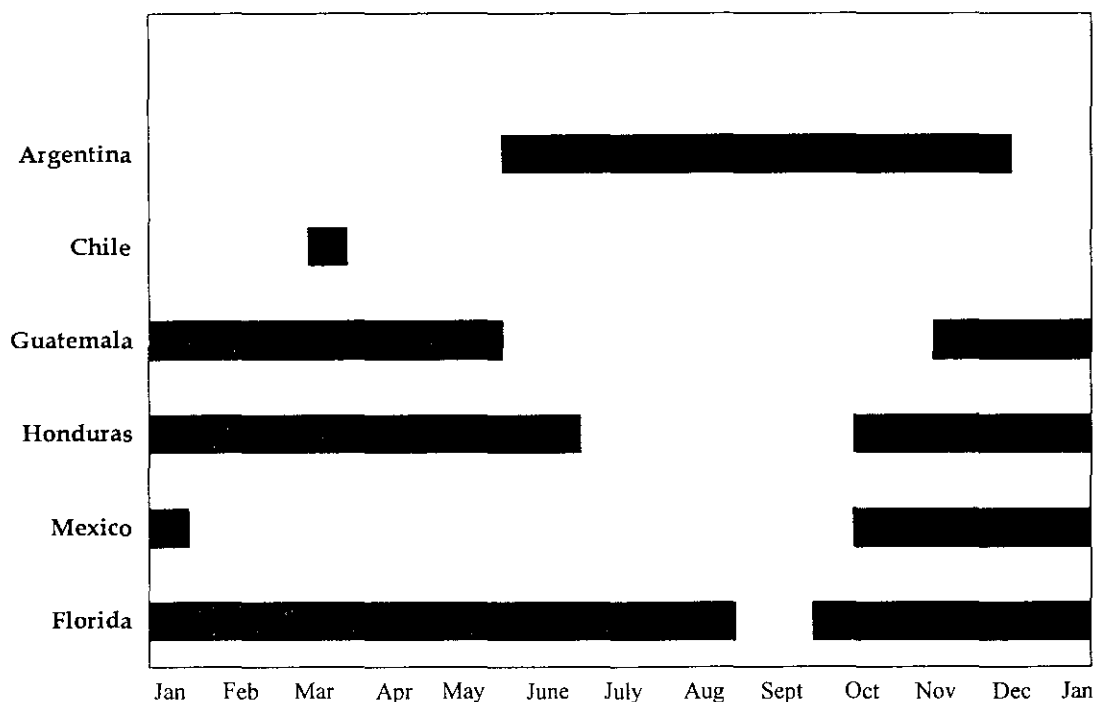


Figure 5. Cantaloupe Harvest/Export Season in Selected Countries

Cucumber Harvest/Export Season in Selected Countries



Source: See Appendix 1 for a complete list of sources.

Imports from Selected Countries and Total Production

	Monthly Imports (000s Pounds)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chile	0	0	55	49	0	0	0	0	0	0	0	0
Guatemala	617	439	115	49	0	0	0	9	0	0	0	7
Honduras	4,464	5,757	2,554	2,253	39	0	0	0	0	0	438	3,019
Mexico	81,444	65,832	53,603	29,277	12,305	7,919	5,848	2,865	1,906	6,745	40,037	73,468
	Total Annual Imports (000s Pounds)						Total Production (000s Pounds)					
Argentina	0						N.A.					
Chile	103						63,945					
Columbia	0						8,820					
Guatemala	1,237						N.A.					
Honduras	18,524						N.A.					
Mexico	381,248						639,450					

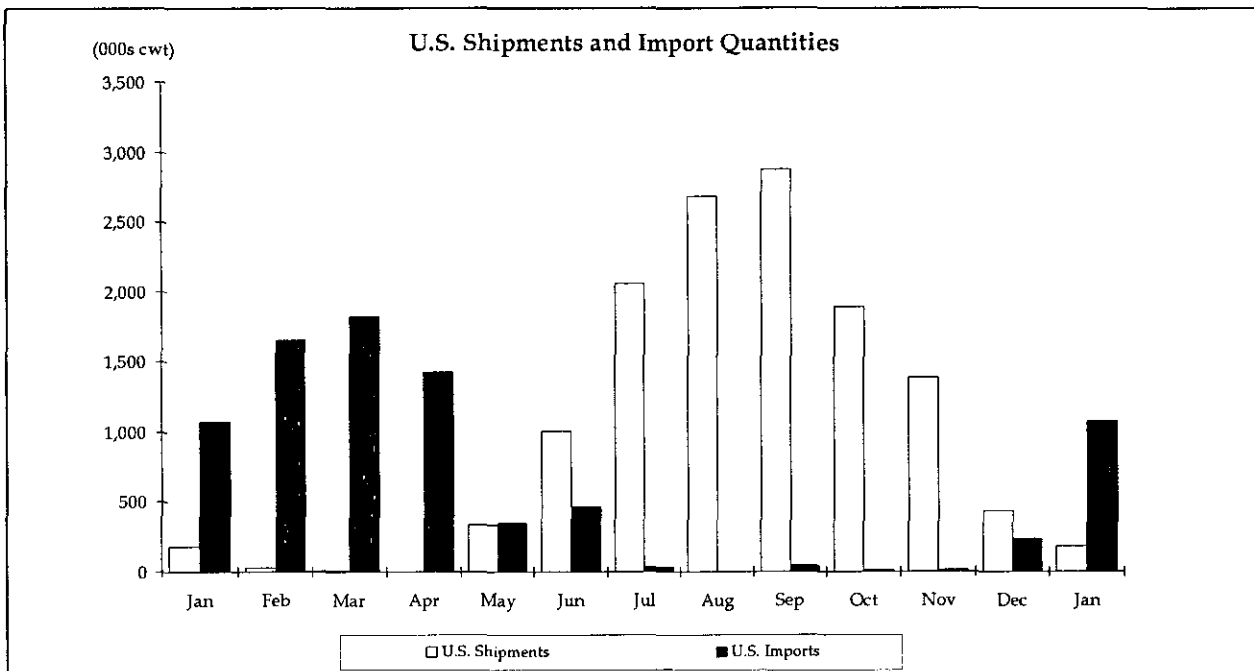
Note: Monthly quantities four-year averages from 1989 to 1992

Total Annual Imports is a four-year average from 1989 to 1992

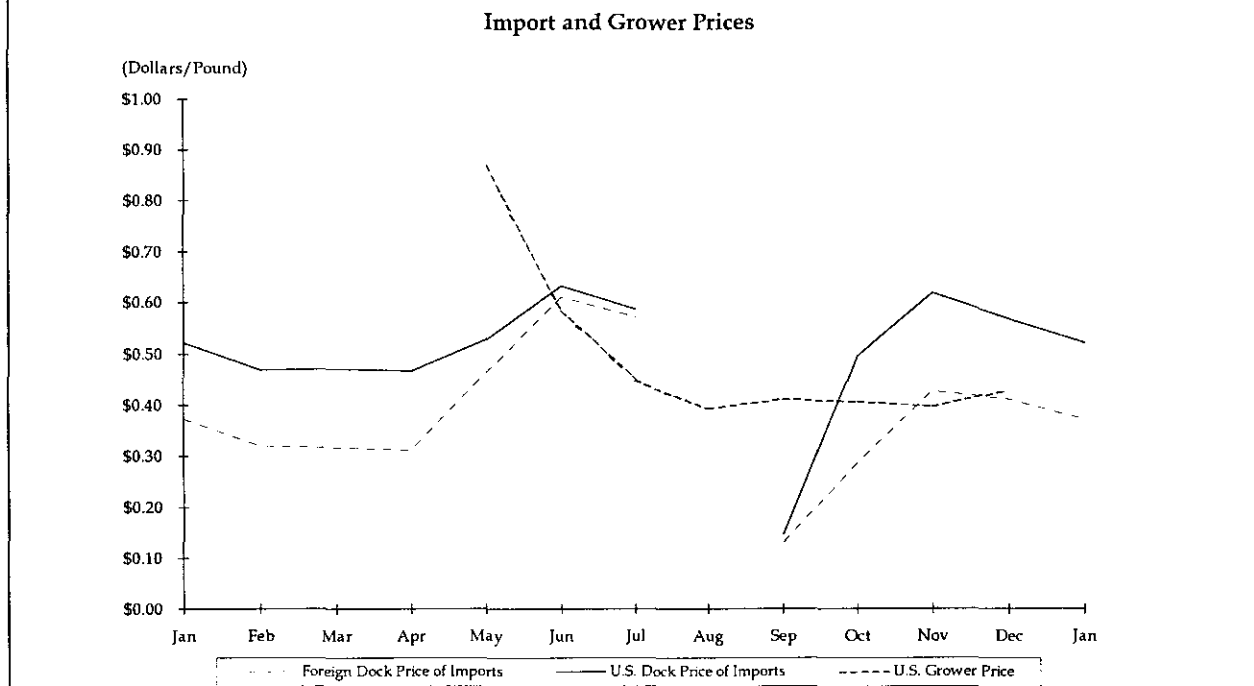
Total Production is a three-year average from 1989 to 1991

Source: Department of Commerce, IM-145 Database.

Figure 6. Cucumber Harvest/Export Season in Selected Countries

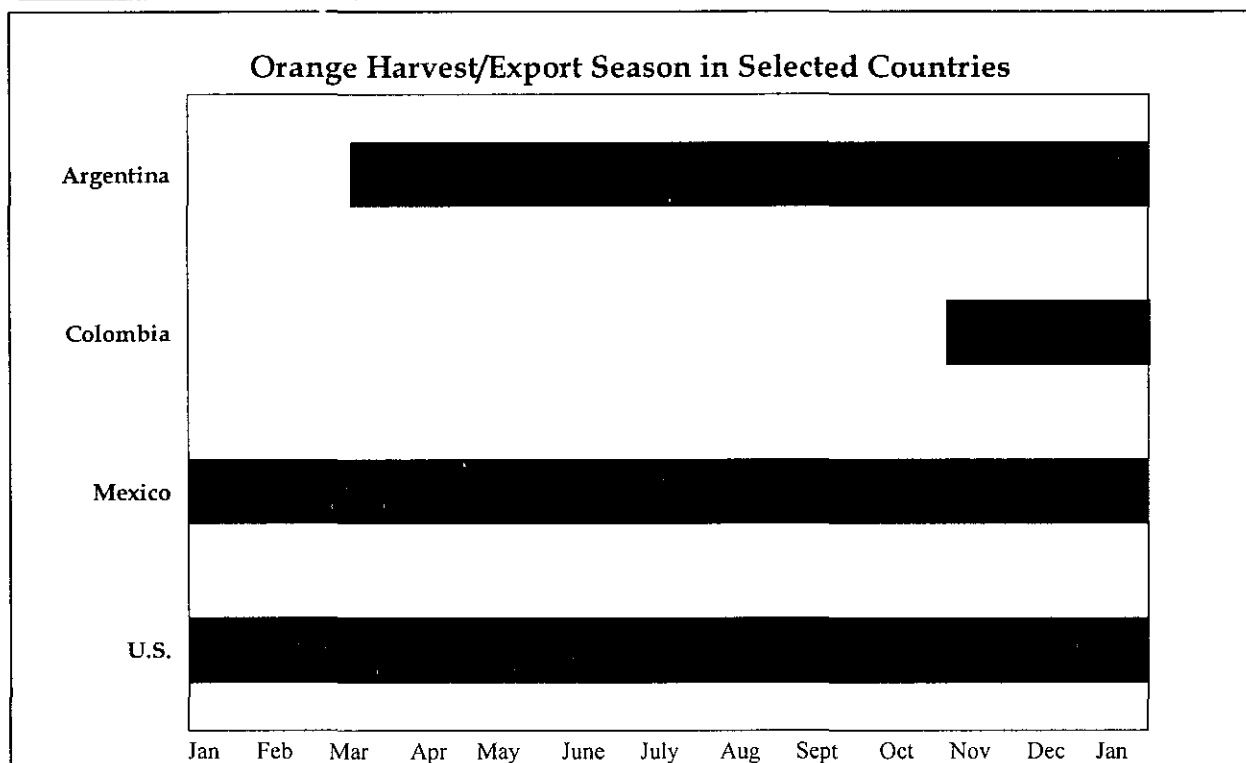


Notes: Monthly quantities represent four-year averages from 1989 to 1992.
 Source: Department of Commerce, IM-145 database and USDA FVAS-4, various years.



Notes: Monthly quantities represent four-year averages from 1989 to 1992.
 Source: Department of Commerce, IM-145 database.

Figure 7. U.S. Shipments and Import Quantities and Import Grower Prices for Grapes



Source: See Appendix 1 for a complete list of sources.

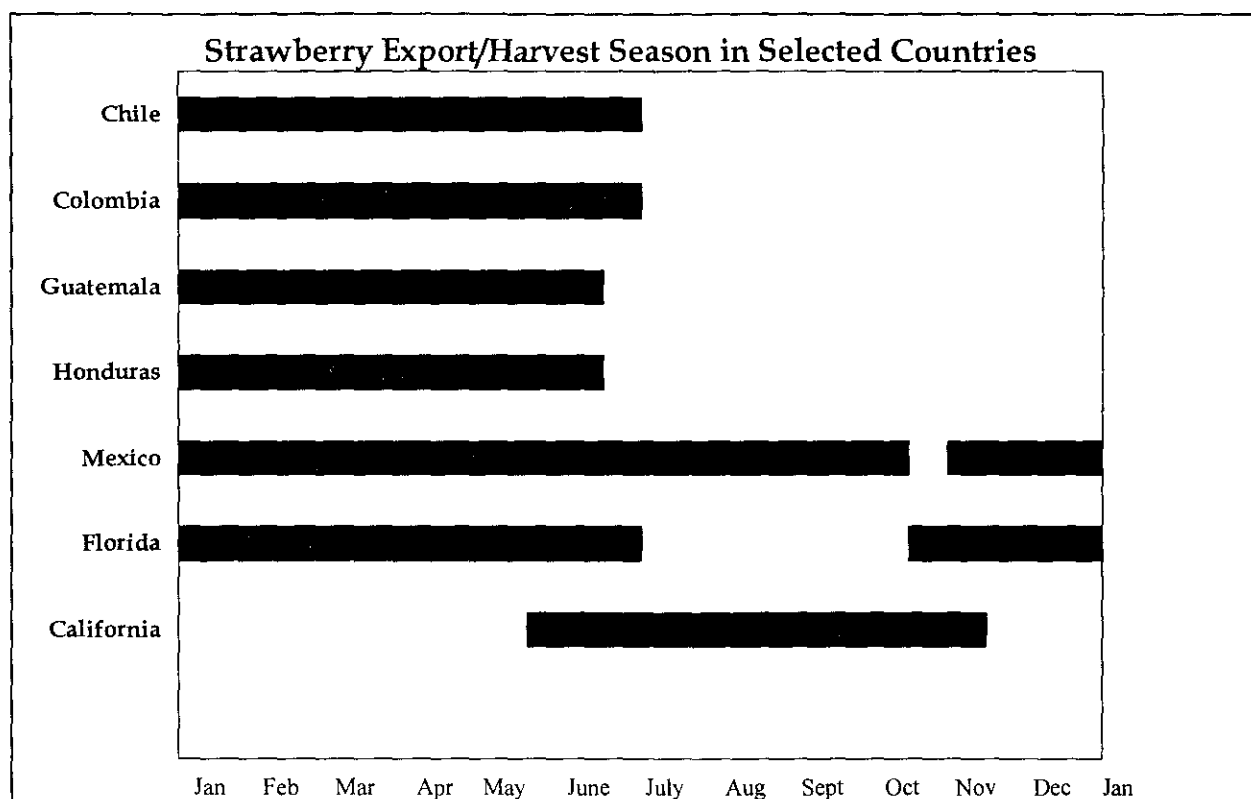
Imports from Selected Countries and Total Production

	Monthly Imports (000s Pounds)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Argentina	0	0	0	0	0	0	3	0	0	0	0	0
Mexico	2,026	2,447	3,295	4,213	3,076	1,371	156	0	8	419	453	529
	Total Annual Imports (000s Pounds)						Total Production (000s Pounds)					
Argentina	3						1,550,850					
Chile	0						232,260					
Columbia	0						775,425					
Guatemala	0						N.A.					
Honduras	0						108,780					
Mexico	17,993						3,236,940					

Note: Monthly quantities four-year averages from 1989 to 1992
 Total Annual Imports is a four-year average from 1989 to 1992
 Total Production is a three-year average from 1989 to 1991

Source: Department of Commerce, IM-145 Database

Figure 8. Orange Harvest/Export Season in Selected Countries



Source: See Appendix 1 for a complete list of sources.

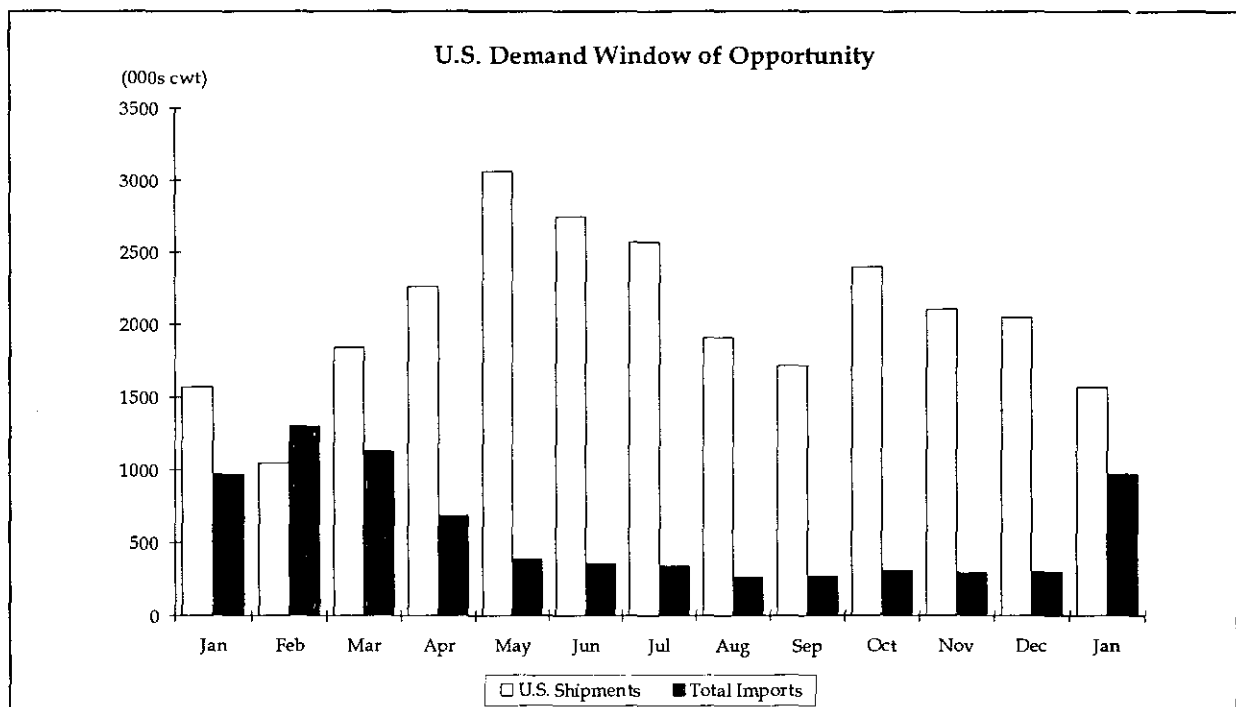
Imports from Selected Countries and Total Production

	Monthly Imports (000s Pounds)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Argentina	0	0	0	0	0	0	0	0	0	1	3	0
Chile	1	0	0	0	0	0	10	0	0	1	8	3
Colombia	110	54	18	4	0	0	2	0	6	142	399	267
Guatemala	552	320	65	4	0	0	0	0	0	11	187	304
Honduras	19	20	0	0	0	0	0	0	0	0	0	0
Mexico	3,093	3,639	5,690	6,319	3,390	1,848	298	10	2	10	916	1,664
	Total Annual Imports (000s Pounds)						Total Production (000s Pounds)					
Argentina	4						16,832					
Chile	24						16,008					
Colombia	1,000						N.A.					
Guatemala	1,444						5,513					
Honduras	39						N.A.					
Mexico	26,879						176,172					

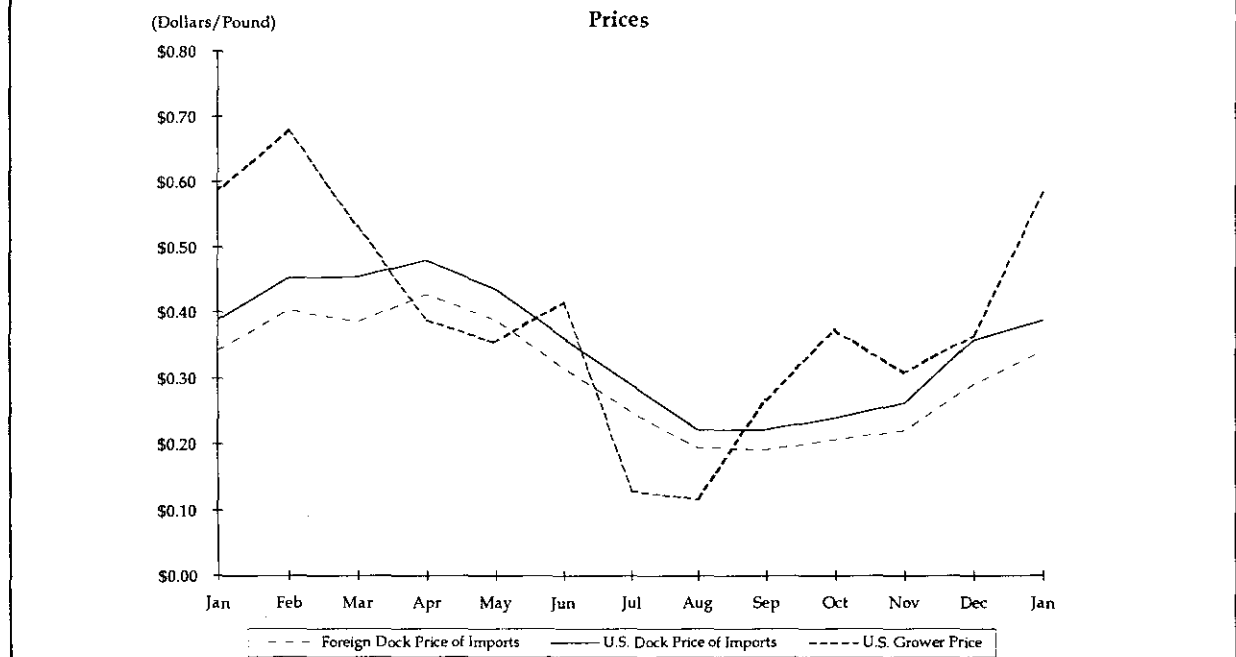
Note: Monthly quantities four-year averages from 1989 to 1992
 Total Annual Imports is a four-year average from 1989 to 1992
 Total Production is a three-year average from 1989 to 1991

Source: Department of Commerce, IM-145 Database

Figure 9. Strawberry Export/Harvest Season in Selected Countries



Note: Monthly quantities represent four-year averages from 1989 to 1992
 Source: Department of Commerce, IM-145 datagase and USDA FVAS-4, various years.



Note: Monthly quantities represent four-year averages from 1989 to 1992.
 Source: Department of Commerce, IM-145

Figure 10. U.S. Demand Window of Opportunity and Prices for Tomatoes

Table 1. U.S. fresh fruit and vegetable imports from Latin America

	Arg.	Bah.	Braz	Chile	Col.	C.R.	Dom. Rep.	Ec.	El Sal.	Guat.	Guy.	Hon.	Jam.	Mex.	Pan.	Peru	Ven.	Totals
Apples	173	0	0	554	0	0	0	0	0	0	0	0	0	0	0	0	0	728
Apricots	0	0	0	19	2	0	0	0	0	0	0	0	0	0	0	0	0	21
Artichokes	0	0	0	9	1	0	0	0	0	0	0	0	0	0	0	0	0	9
Asparagus	4	0	0	38	0	0	0	1	0	3	0	0	0	374	0	52	0	471
Avocados	0	2	0	251	0	0	67	0	0	0	0	0	0	0	0	0	0	319
Bananas	0	0	0	0	9,121	15,714	37	22,078	0	6,907	2,295	7,989	1	3,496	1,316	0	73	69,025
Beans	0	0	0	0	0	0	0	0	0	1	0	0	0	274	0	0	0	275
Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	22
Blueberries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broccoli	0	0	0	0	0	2	0	0	0	2	0	0	0	230	0	0	0	234
Brussel Sprouts	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	0	92
Cabbage	0	0	0	0	0	1	0	0	0	0	0	0	0	268	0	0	0	269
Cantaloups	0	1	0	0	0	540	156	0	82	416	0	959	0	3,089	12	0	0	5,253
Carrots	0	0	0	0	0	0	0	0	0	0	0	0	0	406	0	0	0	406
Cauliflower	0	0	0	0	0	0	0	0	0	0	0	0	0	164	0	0	0	164
Celery	0	0	0	0	0	0	0	0	0	22	0	0	0	327	0	0	0	349
Cherries	0	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0	34
Chinese Cabbage	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	24
Corn, Sweet	0	0	0	0	0	0	0	0	0	0	0	0	0	291	0	0	0	291
Cucumbers	0	57	0	0	0	0	1	0	0	12	0	186	0	3,826	0	0	0	4,082
Eggplant	0	0	0	0	0	0	1	0	0	0	0	1	0	406	0	0	0	408
Endive	0	0	0	4	0	0	0	0	0	5	0	0	0	3	0	0	0	12
Fruits, Other	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	21
Garlic	70	0	0	23	0	0	0	0	0	3	0	0	0	212	0	1	0	309
Grapefruit	0	144	0	0	0	0	10	0	0	0	0	0	1	2	0	0	0	156
Grapes, Table	0	0	0	6,339	0	0	0	0	0	0	0	0	0	743	0	0	0	7,082
Greens	0	0	0	0	0	0	0	0	0	0	0	0	0	171	0	0	0	171
Honeydews	0	0	8	0	0	52	3	11	29	59	0	18	0	1,076	30	0	0	1,283
Kiwifruit	0	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0	0	94
Lemons	0	130	0	34	0	0	1	0	0	0	0	0	0	0	0	0	0	164
Lettuce Iceberg	0	0	0	0	0	0	0	0	0	0	0	0	0	266	0	0	0	266
Lettuce Romaine	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	17
Lettuce Other	0	0	0	0	0	0	0	0	0	0	0	0	0	63	0	0	0	63
Limes	0	38	0	0	2	3	0	1	3	1	0	9	0	1,622	0	0	1	1,679
Mangoes	0	0	15	0	0	0	0	3	0	0	0	0	0	1,358	0	18	4	1,398

TABLES

Table 1. Continued

	Arg.	Bah.	Braz.	Chile	Col.	C.R.	Dom. Rep.	Ec.	El Sal.	Guat.	Guy.	Hon.	Jam.	Mex.	Pan.	Peru	Ven.	Totals
Misc. Citrus Fruit	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	13
Misc. Herbs	0	0	0	0	0	0	0	0	0	0	0	0	0	108	0	0	0	108
Oriental ^a	0	0	0	0	0	0	0	0	0	0	0	0	0	63	0	0	0	63
Tropical ^b	0	0	26	0	121	712	693	0	0	0	1	4	129	285	4	0	4	1,978
Mixed-Melons	0	1	23	5	0	241	21	47	84	211	0	53	0	86	161	0	0	930
Mushrooms	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Okra	0	0	0	0	0	0	0	0	0	1	0	0	0	937	0	0	0	938
Onions, Dry	1	0	0	83	0	1	0	0	0	19	0	1	0	1,967	1	0	0	2,074
Onions, Green	0	0	0	0	0	0	0	0	0	12	0	0	0	1,896	0	0	0	1,909
Oranges	0	4	0	0	0	0	81	0	0	0	0	0	25	190	0	0	0	299
Papaya	0	18	0	0	0	0	4	0	0	0	0	0	8	161	0	0	0	191
Parsley	0	0	0	0	0	0	0	0	0	0	0	0	0	33	0	0	0	33
Peaches	0	0	0	1,074	0	0	0	0	0	0	0	0	0	4	0	0	0	1,078
Pears	277	0	0	588	0	0	0	0	0	0	0	0	0	0	0	0	0	864
Peas, Green	0	0	0	0	0	0	0	1	0	119	0	0	0	79	0	0	0	199
Peas, Other	0	0	0	0	0	0	2	0	0	89	0	1	0	85	0	0	0	176
Peppers, Bell	0	0	0	0	0	0	5	0	0	0	0	0	1	1,936	0	0	0	1,942
Peppers, Other	0	0	0	0	0	0	1	0	0	0	0	0	0	739	0	0	0	740
Pineapples	0	0	0	0	5	1,197	672	0	0	0	0	472	0	230	0	0	0	2,575
Plantains	0	0	0	0	1,609	68	34	1,139	0	28	0	58	0	0	6	0	272	3,214
Plums	0	0	0	511	0	0	0	0	0	0	0	0	0	0	0	0	0	511
Potatoes, Table	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potatoes, Seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pumpkins	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Radishes	0	0	0	0	0	0	0	0	0	0	0	0	0	283	0	0	0	283
Raspberries	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	22
Spinach	0	0	0	0	0	0	0	0	0	0	0	0	0	66	0	0	0	66
Squash	0	0	0	0	0	15	1	0	0	0	0	30	9	2,592	11	0	0	2,657
Strawberries	0	0	0	0	10	4	3	0	0	14	0	1	0	266	0	0	0	298
Tangerines	0	0	0	0	0	0	1	0	0	0	0	0	1	224	0	0	0	225
Tomatoes	0	12	0	0	0	1	20	0	0	1	0	1	0	6,402	0	0	2	6,438
Tomatoes, Cherry	0	0	0	0	0	0	0	0	0	0	0	0	0	731	0	0	0	731

Table 1. Continued

	Arg.	Bah.	Braz.	Chile	Col.	C.R.	Dom. Rep.	Ec.	El Sal.	Guat.	Guy.	Hon.	Jam.	Mex.	Pan.	Peru	Ven.	Totals
Turnips-Rutabagas	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4
Vegetables, Other	0	0	0	0	0	0	0	0	0	0	0	0	0	528	0	0	0	528
Watermelons	0	0	0	0	0	36	9	0	13	15	0	65	0	3,163	24	0	0	3,324
<i>Total</i>	<i>524</i>	<i>405</i>	<i>71</i>	<i>9,681</i>	<i>10,870</i>	<i>18,586</i>	<i>1,820</i>	<i>23,279</i>	<i>210</i>	<i>7,939</i>	<i>2,296</i>	<i>9,845</i>	<i>186</i>	<i>41,896</i>	<i>1,565</i>	<i>72</i>	<i>355</i>	<i>129,597</i>

Note: Uruguay and Nicaragua have been excluded from the table because their fresh fruit and vegetable exports to the United States are negligible, under 50,000 cwt.

^aThe complete commodity title is "oriental vegetables."

^bThe complete commodity title is "tropical fruits and vegetables."

Source: Fresh Fruit and Vegetable Shipments, USDA, Agricultural Marketing Service, Calendar Year 1992.

Table 2. Calgene projected revenues: 1990, 1995, and 2000

	1990	1995 ^a	2000
Revenues		(1,000 dollars)	
Fresh tomatoes	0	54,500	185,000
Oils business	4,567	18,200	300,000
Other seeds business	10,792	23,200	55,000
Product development	5,736	1,500	0
Interest income	1,725	1,000	3,500
Other income	84	200	200

^aProjections

Source: Montgomery Securities, April 1993.

Table 3. Product choice criteria: U.S. shipments, imports from selected countries, per capita growth, and price-to-weight ratio for the selected products

	Price-to-Weight Ratio	U.S. Shipments ^a (000s cwt.)	Imports from six Selected Countries (000s cwt.)	Selected Countries' Import Share of U.S. consumption ^b	5-year annualized per capita growth in U.S. consumption (1988-1992)	20-year annualized per capita growth in U.S. consumption (1973-1992)	U.S. Off-Season Imports Relative to Total Imports, 1992
Asparagus	0.860	1,089	480	28.7%	0.00%	2.16%	96.08%
Bell Peppers	0.560	4,500	1,682	26.6%	4.18%	4.03%	76.49%
Cantaloupe	0.162	6,920	3,804	32.0%	1.85%	6.22%	94.22%
Cucumbers	0.227	5,787	4,043	40.1%	0.52%	3.18%	68.71%
Grapes	0.213	9,694	6,947	41.6%	-1.66%	4.90%	91.31%
Oranges	0.101	34,655	48	0.1%	-1.85%	-0.58%	
Strawberries	0.522	8,097	228	2.7%	1.48%	4.20%	66.22%
Tomatoes	0.363	27,269	4,037	13.1%	-3.78%	0.75%	

Note: U.S. Shipments, Imports, Import Share, and Price-to-Weight Ratio are for 1992.

^aU.S. Shipments for U.S. Consumption = total U.S. shipments – total U.S. exports.

^bSelected Country Import Share of U.S. Consumption = Total imports from selected countries/(total U.S. shipments +total U.S. imports – total U.S. exports)

Table 4. The Latin American economies: An overview of economic descriptors

	GDP	CHANGE IN	GDP PER	INFLATION		INTEREST RATES	
	(\$ Billion)	GDP	CAPITA			Lending	Borrowing
	1992	1992	1992	1992	1993	1992	1992
Brazil	394	(1%)	2,522	677%	1501%	1489%	1560%
Mexico	334	3%	3,730	16%	12%	19%	16%
Argentina	229	9%	6,912	20%	12%	38%	22%
Venezuela	60	7%	2,975	32%	36%	34%	35%
Peru	45	(3%)	2,009	78%	50%	174%	60%
Chile	38	10%	2,786	15%	13%	24%	18%
Colombia	43	4%	1,240	28%	21%	37%	27%
Ecuador	13	3%	1,114	50%	52%	60%	47%
Uruguay	11	7%	3,677	70%	56%	118%	75%
Costa Rica	7	7%	2,096	N.A.	9%	29%	16%
Bolivia	7	3%	833	13%	13%	46%	23%
Paraguay	6	2%	1,432	N.A.	18%	28%	20%

	IMPORTS	EXPORTS	TRADE	BALANCE	FOREIGN	FOREIGN
	\$ Million		BALANCE	OF PAYMENT	DEBT	DEBT
	6/92 to 6/93		\$ Million	1992	\$ Million	(% Face Value)
					June 1992	1993
Brazil	22,197	38,564	16,367	17,738	124,000	38%
Mexico	49,147	28,613	(20,561)	1,746	106,000	72%
Argentina	15,310	12,569	(2,741)	2,418	58,000	52%
Venezuela	N.A.	14,744	N.A.	(1,638)	36,000	67%
Peru	3,943	3,466	(477)	(426)	20,890	33%
Chile	10,063	9,783	(280)	2,501	18,775	91%
Colombia	9,078	7,210	(868)	1,209	17,105	75%
Ecuador	2,300	3,017	717	862	12,600	33%
Uruguay	2,186	1,690	(496)	(49)	7,310	72%
Costa Rica	2,795	1,938	(857)	30	4,075	67%
Bolivia	1,188	683	505	(125)	3,685	16%
Paraguay	1,492	438	(1,060)	540	1,420	N.A.

	TAX	FISCAL	UNEMPLOY-	FOREIGN	INVESTMENT
	REVENUE	DEFICIT	MENT	INVESTMENT	RATE
	1992	1992	1992	1992	1992
Brazil	18%	N.A.	7%	2,000	15%
Mexico	12%	5%	4%	5,800	22%
Argentina	16%	(3%)	11%	2,500	17%
Venezuela	14%	(3%)	8%	1,000	21%
Peru	10%	2%	8%	1,488	15%
Chile	19%	3%	5%	574	19%

Table 4. Continued

	TAX REVENUE 1992	FISCAL DEFICIT 1992	UNEMPLOY- MENT 1992	FOREIGN INVESTMENT 1992	INVESTMENT RATE 1992
Colombia	11%	2%	9%	800	14%
Ecuador	7%	(1%)	10%	83	19%
Uruguay	18%	3%	9%	N.A.	12%
Costa Rica	16%	(2%)	4%	N.A.	21%
Bolivia	2%	(1%)	7%	N.A.	13%
Paraguay	9%	(1%)	6%	126	24%

Source: "Regional Moves," *America Economica*, special Issue/ 1993-1994, pp.120-1.

Table 5. Agricultural trade descriptors: Selected product exports to the United States, fruit and vegetable exports to the world, and nonanimal exports to the United States.

	Total Selected Product Exports to the United States Landed Value (\$000)				Total Fresh Fruit and Vegetable Exports to the World for 1991(\$000)	Total Nonanimal Agricultural Exports to the U.S. for 1992 (\$000)
	1989	1990	1991	1992		
Argentina	363	282	231	509	609,550	283,805
Chile	278,699	383,315	294,831	291,639	1,302,861	490,221
Columbia	426	2,502	1,549	2,522	509,240	300,232
Guatemala	7,006	7,232	8,584	12,427	106,600	208,884
Honduras	17,245	16,943	20,178	22,466	384,360	44,371
Mexico	525,902	730,940	654,076	466,339	1,263,230	1,597,626

Sources:

Nonanimal Agricultural Exports to the United States for 1992: *Foreign Agricultural Trade of the United States*, 1992 Supplement, USDA, Table 17.

Total Selected Product Exports to the United States, FAS Value for 1992: Department of Commerce, IM-145 database.

Fresh Fruit and Vegetable Exports: *FAO Trade Yearbook 1991*, Food and Agriculture Organization of the United Nations, (Rome, 1992)

Table 6. Labor intensity of fresh fruits and vegetables

Fresh Fruit or Vegetable	Labor Intensity (percent)
Asparagus	70
Bell Peppers	63
Cantaloupes	60
Cucumbers	55
Grapes	72
Oranges	60
Strawberries	68
Tomatoes	74

Source: University of California Cooperative Extension and University of Florida Cooperative Extension

Table 7. Measure of comparative advantage of Latin American production relative to the United States

	U.S.	Argentina	Chile	Colombia	Guatemala	Honduras	Mexico
<i>Asparagus</i>							
Cost Ratio	1.00	0.68	1.00	0.95	1.02	N.A	2.05
Cost Per Pound	\$0.91	\$0.84	\$0.80	\$0.67	\$0.57	N.A	\$0.00
<i>Bell Peppers</i>							
Cost Ratio	1.00	N.A	0.60	0.48	0.94	0.75	1.24
Cost Per Pound	\$0.28	N.A	\$0.29	\$0.16	\$0.16	\$0.20	\$0.00
<i>Cantaloupes</i>							
Cost Ratio	1.00	0.07	0.10	0.11	0.57	0.35	1.01
Cost Per Pound	\$0.16	\$0.22	\$0.22	\$0.22	\$0.14	\$0.16	\$0.13
<i>Cucumbers</i>							
Cost Ratio	1.00	N.A	0.44	0.71	0.63	1.02	1.17
Cost Per Pound	\$0.18	N.A	\$0.19	\$0.20	\$0.17	\$0.17	\$0.00
<i>Grapes</i>							
Cost Ratio	1.00	(1.11)	0.72	0.60	0.52	N.A	1.26
Cost Per Pound	\$0.34	\$0.80	\$0.33	\$0.30	\$0.31	N.A	\$0.00
<i>Oranges</i>							
Cost Ratio	1.00	(1.67)	(2.11)	(1.46)	0.58	0.47	0.80
Cost Per Pound	\$0.06	\$0.16	\$0.16	\$0.16	\$0.00	\$0.00	\$0.06
<i>Strawberries</i>							
Cost Ratio	1.00	(0.08)	(0.33)	0.45	0.58	0.47	1.86
Cost Per Pound	\$0.59	\$0.80	\$0.86	\$0.61	\$0.53	\$0.52	\$0.28
<i>Tomatoes</i>							
Cost Ratio	1.00	1.26	1.90	0.62	0.53	0.43	1.84
Cost Per Pound	\$0.32	\$0.21	\$0.18	\$0.28	\$0.29	\$0.28	\$0.19

Source: See the **Costs of Production** section for a discussion of production cost advantage (disadvantage) ratios and per pound cost calculations.

Table 8. Labor ratio: Foreign labor rates relative to the U.S. agriculture hourly wage rates

	Foreign Labor	U.S. Labor	Ratio
Argentina	\$0.72	\$5.50	13.00%
Chile	\$0.65	\$5.50	11.84%
Colombia	\$0.31	\$5.50	5.68%
Guatemala	\$0.47	\$5.50	8.47%
Hondorus	\$0.33	\$5.50	6.06%
Mexico	\$1.00	\$5.50	18.17%

Source: See **The Costs of Production** section for an explanation of foreign and domestic hourly wage estimates.

Table 9. Transportation rates to the United State by product country pair

	Argentina	Chile	Colombia	Guatemala	Honduras	Mexico
(dollars per pound)						
Asparagus	0.50	0.45	0.37	0.25	0.00	0.01
Bell Peppers	N.A.	0.17	0.17	0.04	0.04	0.04
Cantaloups	0.14	0.14	0.14	0.06	0.08	0.02
Cucumbers	N.A.	0.09	0.09	0.09	0.07	0.03
Grapes	0.62	0.15	0.14	0.14	N.A.	0.03
Oranges	0.13	0.13	0.13	0.03	0.03	0.03
Strawberries	0.56	0.63	0.40	0.31	0.31	0.02
Tomatoes	0.04	0.03	0.15	0.15	0.15	0.03

Source: See Appendix 3 for a discussion of transportation rate calculations

Table 10. Production costs in Mexico based on Cook Report

	Bell							
	Asparagus	Peppers	Cantaloupes	Cucumbers	Grapes	Oranges	Strawberries	Tomatoes
Yield	3,600	18,816	12,000	30,360	7,128	17,843	30,000	18,225
<i>Preharvest Costs</i>								
Growing costs	134	581	539	436	593	212	6,250	669
Labor	228	402		326	597	121		373
Land Rent	130	175	200	175	36		450	175
Overhead	235	770	78	712		83	250	789
Subtotal Per Acre	727	1,928	817	1,649	1,226	416	6,950	2,006
<i>Harvest</i>								
Total Per Acre	1,247	1,633	726	1,391	1,358	206	4,625	1,771
<i>Export Activities</i>								
Total Per Acre	606.96	1,336	521	1,725	189	664	2,605	920
<i>Total Costs</i>								
Per Acre	1,974	4,897	2,064	4,765	2,773	1,286	14,180	4,698
Per Pound	0.55	0.26	0.17	0.16	0.39	0.07	0.47	0.26

Source: All costs from Cook et al, *NAFTA: Effects on Agriculture, Volume IV, Fruits and Vegetables Issues*, except for "Export Activities" which is a weighted average calculation of freight, insurance, and duties/tariffs based on U.S. import data from the U.S. Census Bureau

Note: Blank entry means no information reported

APPENDIX 1
Harvest and Export Seasons: Sources and Assumptions

Where there was no reliable information for the harvesting and exporting seasons, we used the U.S. Commerce Department's import data to assume that the harvest and export seasons for a product from a particular country are similar to the product's historical harvest and export periods. While sufficient for the purposes of this study, these estimates likely understate the actual season totals.

ASPARAGUS

California:	<i>U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production.</i> United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
Argentina:	Inferred from 'U.S. Trade & Development Program Definition Mission Report: Agro-Industrial Project, Argentina,' GIC Agricultural Group, 1990.
Chile:	From the software 'Programa de Rentabilidad y Requerimientos del Esparrago Verde,' CIREN, CORFO, Santiago de Chile.
Colombia:	Assumption based on U.S. import data, 1989 - 1992.
Guatemala:	Assumption based on U.S. import data, 1989 - 1992.
Honduras:	Assumption based on U.S. import data, 1989 - 1992.
Mexico:	<i>Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico.</i> Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.

BELL PEPPERS

California:	<i>U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production,</i> United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
Florida:	<i>U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production,</i> United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
Argentina:	Mary S. Coyner, <i>Planting and Harvesting Seasons in Latin America</i> , USDA/FAS FAS-M-37, 1958.
Chile:	N.A.
Colombia:	N.A.
Guatemala:	Assumed to be similar to season in Honduras.
Honduras:	Assumption based on U.S. import data, 1989-1992.
Mexico:	<i>Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico.</i> Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.

CANTALOUPE

- California:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991) and *NAFTA Effects on Agriculture* by Cook et al.
- Argentina:** Mary S. Coyner, *Planting and Harvesting Seasons in Latin America*, USDA/FAS FAS-M-37, 1958. Note: Information is for melons and honeydew. Cantaloupe's harvest season is similar to those melons.
- Chile:** Mary S. Coyner, *Planting and Harvesting Seasons in Latin America*, USDA/FAS FAS-M-37, 1958. Note: Information is for melons and honeydew. Cantaloupe's harvest season is similar to those melons.
- Colombia:** N.A.
- Guatemala:** *Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico*. Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.
- Honduras:** *Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico*. Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.
- Mexico:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).

CUCUMBERS

- California:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
- Florida:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
- Argentina:** Mary S. Coyner, *Planting and Harvesting Seasons in Latin America*, USDA/FAS FAS-M-37, 1958.
- Chile:** Mary S. Coyner, *Planting and Harvesting Seasons in Latin America*, USDA/FAS FAS-M-37, 1958.
- Colombia:** N.A.
- Guatemala:** Assumption based on U.S. import data, 1989 - 1992.
- Honduras:** Assumption based on U.S. import data, 1989 - 1992.
- Mexico:** *Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico*. Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.

GRAPES

- California:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).

Argentina:	Mary S. Coyner, <i>Planting and Harvesting Seasons in Latin America</i> , USDA/FAS FAS-M-37, 1958.
Chile:	Mary S. Coyner, <i>Planting and Harvesting Seasons in Latin America</i> , USDA/FAS FAS-M-37, 1958.
Colombia:	N.A.
Guatemala:	N.A.
Honduras:	N.A.
Mexico:	<i>U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production</i> , United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).

ORANGES

U.S.:	<i>Foreign Agriculture 1992</i> , United States Department of Agriculture, Foreign Agricultural Service, 1993.
Argentina:	Correspondence with EXARCO Sociedad Anonima in Buenos Aires, Argentina
Chile:	Assumption based on U.S. import data, 1989 - 1992.
Colombia:	Assumption based on U.S. import data, 1989 - 1992.
Guatemala:	N.A.
Honduras:	N.A.
Mexico:	<i>Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico</i> . Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.

STRAWBERRIES

California:	<i>U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production</i> , United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
Florida:	<i>U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production</i> , United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
Argentina:	Correspondence with EXARCO Sociedad Anonima in Buenos Aires, Argentina and U.S. import data from 1989-1992.
Chile:	From the software 'Programa de Rentabilidad y Requerimientos del Frambuesa,' CIREN, CORFO, Santiago de Chile. Assumes that harvest period for strawberries is similar to that of raspberries.
Colombia:	Assumption based on U.S. import data, 1989 - 1992.
Guatemala:	Assumption based on U.S. import data, 1989 - 1992.
Honduras:	Assumption based on U.S. import data, 1989 - 1992.
Mexico:	<i>Agriculture in a North American Free Trade Agreement: Analysis of Liberalizing Trade between the United States and Mexico</i> . Economic Research Service, USDA, Foreign Agricultural Economic Report, No. 246.

TOMATOES

- California:** Roberta Cook et al, *NAFTA: Effects on Agriculture, Volume IV, Fruits and Vegetable Issues*, American Farm Bureau Research Foundation, 1991.
- Florida:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
- Mexico:** *U.S. - Mexico Trade: Extent to Which Mexican Horticultural Exports Complement U.S. Production*, United States General Accounting Office, GAO/NSIAD-91-94BR (March 1991).
- Argentina:** Mary S. Coyner, *Planting and Harvesting Seasons in Latin America*, USDA/FAS FAS-M-37, 1958.
- Chile:** Mary S. Coyner, *Planting and Harvesting Seasons in Latin America*, USDA/FAS FAS-M-37, 1958, and assumptions based on U.S. imports from 1989-1992.
- Colombia:** Assumption based on U.S. import data, 1989 - 1992.
- Guatemala:** Assumption based on U.S. import data, 1989 - 1992.
- Honduras:** Assumption based on U.S. import data, 1989 - 1992.

APPENDIX 2

Labor Calculations

All exchange rates used in converting foreign currencies to U.S. dollars are drawn from *Economic and Social Progress in Latin America*, 1993 Report, Special Section, Human Resources, the Inter-American Development Bank.

Argentina

Because there is no reliable agricultural wage-rate information for Argentina, a conservative estimate is made using available information. We assume the ratio of Argentinean to Chilean agricultural wage rates in 1987 to be similar to the ratio of Argentinean to Chilean manufacturing rates in 1987. This estimate of the Argentinean agricultural wage rate is then converted to dollars and indexed for inflation using the U.S. Consumer Price Index.

Chile

Chilean labor costs per day for 1989 range from 800 to 1200 pesos (*Manual de Operacion, Programa Rentabilidad y Requerimientos, Various Fruits and Vegetables*, CIREN Corfo). Using the upper end of this range and a nine hour day results in an hourly wage of 133 pesos. This figure is multiplied by the increase in the Chilean CPI from 1989 to 1992 which was 77.6 percent (International Financial Statistics, September 1993). The result is an hourly wage of 236.21 pesos. Converting this figure to dollars produces an estimated 1992 Chilean agricultural hourly wage rate of \$.6514.

Colombia

The upper end of 1989 Colombian daily labor costs is 1000 pesos (*Costos De Produccion Agropecuarios por Hectarea Para 1989*, Instituto Colombiano Agropecuario). Assuming a nine hour day results in an hourly wage of 111 pesos. This figure is multiplied by the increase in the Colombian CPI from 1989 to 1992 (113.92 percent), producing an hourly wage of 237.45 pesos. Converting this figure to dollars results in an estimated 1992 Colombian agricultural hourly wage rate of \$.3124.

Guatemala

Daily labor costs in Guatemala for 1991 ranged from 13 to 40 quetzales, with a mode of approximately 20 quetzales. Using a 9 hour day results in an hourly wage of 2.2 quetzales. Multiplying this figure by the increase in the Guatemalan CPI for 1992 (10.1 percent) produces an hourly wage of 2.42 quetzales. Converting this figure to dollars results in an estimated 1992 Guatemalan agricultural hourly wage rate of \$.4658.

Honduras

The 1992 Honduran daily agricultural wage rate for exported tobacco, cantaloupe, and coffee was 17.5 lempiras (Departamento de Estudios Economicos Honduras en Cifra, 1990-1992). Assuming a nine hour

workday, the hourly wage is 1.94 lempiras. Converting this figure to dollars results in an estimated 1992 Honduran agricultural hourly wage rate of \$.33.

Mexico

In 1991, daily wage rates for asparagus production in Mexicali were 18,000 to 20,000 pesos (Roberta Cook et al. *NAFTA: Effects on Agriculture*, Volume IV, Fruits and Vegetables Issues). Using the upper end of this range gives an hourly wage rate of 2222 pesos per hour; assuming a nine hour day.

Multiplying the hourly rate by the increase in the Mexican CPI from 1991 to 1992 (39 percent) results in a 1992 hourly wage of 3091.36 pesos. Converting this figure to dollars results in an estimated 1992 Mexican agricultural hourly wage rate of \$1.00.

APPENDIX 3

Transportation Calculations and Assumptions

The cost of transporting most products from the foreign country to the United States includes insurance, freight, and additional international charges other than import duties. Our estimates are derived from 1992 Free Along Side (FAS) and Cost, Insurance, Freight (CIF) values collected by the U.S. Department of Commerce, Bureau of the Census, Foreign Trade Division.¹

A lack of reliable information for some countries and products necessitated the following assumptions:

ASPARAGUS

- The 1991 calculated transportation rate for Argentina supplants the 1992 figure as the latter is anomalous.
- From 1989 to 1992, there are no asparagus import data for Honduras. Since Guatemalan international transportation costs, in general, are similar to Honduras', the former's transportation-cost estimates are used as a proxy for the latter's.

BELL PEPPERS

- In the absence of significant bell pepper import data from Chile and Colombia, 1992 Brazilian data are used as a proxy. This is a conservative estimate as Brazil's transportation costs are typically higher than either Chile's or Colombia's.
- For Honduras, the most recent information is from 1990.
- Between 1989 and 1992, there are no bell pepper import data from Guatemala. Since Honduran international transportation costs are similar to Guatemala's, the former's transportation-cost estimates are used as a proxy for the latter's.

CANTALOUPE

- For Chile, the most recent information is from 1989.
- For Argentina and Colombia, Chilean data are used as a conservative proxy.

CUCUMBERS

- For Colombia, Chilean data are used as a conservative proxy.

GRAPES

- Colombian figures for 1991 are used for 1992 as well.

¹ Individuals in the shipping industry confirmed the reasonableness of the estimates.

- For Guatemala, Colombian data are used as a proxy.

ORANGES

- For Guatemala and Honduras, Mexican data are used as a proxy.
- For Argentina, Chile, and Colombia, 1990 import data are used as a proxy for incomplete 1992 data.

STRAWBERRIES

- For Honduras, 1992 Guatemalan data are used because the Honduran data are unrealistically low.

TOMATOES

- 1990 Argentinean data are used because they are the most recent information available.
- 1989 Chilean data are used because they are the most recent information available.
- 1991 Colombian data are used because they are the most recent information available.
- For Honduras and Guatemala, Colombian data are used as proxies.

ENDNOTES

- ¹ Depending on the supply elasticity.
- ² U.S. Department of Commerce Trade Database for average annual imports, 1989 - 1992.
- ³ United States Department of Agriculture, Economic Research Service, *Fruit and Tree Nut Situation and Outlook Yearbook*; July 1993, p. 68.
- ⁴ Ibid.
- ⁵ Tomatoes and strawberries are produced year round in Florida and California.
- ⁶ Some portion of the increased demand will be met by domestic sources other than California and Florida. However, output from these states comprises a small percentage of total domestic production and is not considered a viable, long-term competitive threat to Latin American production.
- ⁷ For example, exports of asparagus from Chile are not competitive in the United States because of higher tariffs during certain marketing periods, offsetting Chile's production-cost advantage.
- ⁸ Pete Hakim, "President Bush's Southern Strategy: The Enterprise for the America's Initiative," *The Washington Quarterly* (1992 Spring).
- ⁹ For example, some countries such as Peru are still in the early stages of privatization of state-owned enterprise Brazil is attempting to reduce inflationary demands by issuing a new currency; and Argentina, Chile, and most other Southern Cone countries are liberalizing their trade regimes under regional trade pacts.
- ¹⁰ Chilean grapes and Mexican tomatoes were both beneficiaries of favorable, government-induced macroeconomic climates.
- ¹¹ For example, the World Bank and the Inter-American Development Bank have established a fund for investment guarantees in infrastructure projects in Latin America which will be launched first in Argentina. The International Finance Corporation helped launch the Scudder Fund for Independent Power in Latin America, which invests in private power development. Paul Helmut, "Long-Term Fundamentals Dominate Capital Inflow into Latin America," *Corporate Finance in Latin America 1994*, p. 6.
- ¹² Out of a maximum of 5 points, the countries were rated as follows: Chile 3.02, Brazil 2.84, Venezuela 2.78, Argentina 2.76, and Mexico 2.66. "Infrastructure in Latin America," *The Economist*, July 17, 1993, p. 38.
- ¹³ International Produce Journal, October 1993, 2(5): 33.

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- ¹⁴David Kaimovitz, *El Apoyo Tecnológico Necesario para Promover las Exportaciones Agrícolas No Tradicionales en América Central*, Instituto Interamericano de Cooperación para la Agricultura, July 1992, p. 21.
- ¹⁵Nurul Islam, "Horticultural Exports of Developing Countries," *International Food Policy Research Institute Research Report 90*, April 1990, p. 11.
- ¹⁶In their many-commodity, many-factor study of world trade entitled "Comparative Advantage in Transition Economies," E. Kwan Choi and Stanley R. Johnson conclude that a country will have a comparative advantage in economic activities that extensively use cheap inputs.
- ¹⁷There are some exceptions where Latin American producers, such as Chilean grape growers, achieve yields similar to U.S. producers.
- ¹⁸Colin I. Bradford, Jr., *Strategic Options for Latin America in the 1990's*, OECD, 1992, at 181.
- ¹⁹Mark A. Baker and Mark D. Holmes, "An Analysis of Latin American Foreign Investment Law: Proposals for Striking a Balance Between Foreign Investment and Political Stability," *Inter-American Law Review*, 1991, 23:1.
- ²⁰U.S. Market Access in Latin America - Recent Liberalization Measures and Remaining Barriers, USITC Publication 2521, June 1992, pp. 2-8.
- ²¹In "Trade Impacts of Soviet Reform: A Heckscher-Ohlin-Vanek Approach," Dermot J Hayes, Alexander Kumi, and Stanley R. Johnson assume that the U.S. and the Former Soviet Union (FSU) have similar resource bases and similar technology, and use available data on the resource bases in both countries to predict the future trade pattern of the FSU.
- ²²Asparagus, Bell Peppers, Cantaloupes, Tomatoes: *Guidelines to Production Costs and Practices, 1992-1993, Vegetable Crops*, Circular 104-V; University of California, Imperial County, Cooperative Extension. Cucumbers, Strawberries: *Production Cost for Selected Vegetables in Florida, 1992-1993*, Scott A. Smith and Timothy G. Taylor, University of Florida, Institute of Food and Agricultural Sciences, Florida Cooperative Extension Service. Grapes: based on Cook et al 1991, Californian table grape production cost estimates and labor intensity assumptions based on labor intensity patterns for Californian table grape production in prior years.
- ²³Jane E. Brody, "A Cool Look at Genetically Altered Foods. Real Benefits and Some Possible Risks," *New York Times*, May 19, 1993.
- ²⁴Tom Webb, "Scientists Mix, Match Everything for Crops," *Lubbock Avalanche-Journal*, August 2, 1992.

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- ²⁵Doris Stanley, "Mysteries of Ripening," *Agricultural Research*, United States Department of Agriculture, Agricultural Research Service, June 1992, p. 16.
- ²⁶Vince Mazzola, "Bruising in Tomatoes," *Agricultural Research*, United States Department of Agriculture, Agricultural Research Service, June 1992, p. 13.
- ²⁷"Congressional Hearings on Agricultural Biotechnology and Food Safety," *National Biological Impact Assessment Program (NBIAP) News Report*, May 1993, p. 3.
- ²⁸Doris Stanley, "Scientists Identify Single Gene That May Control Plant Dormancy," *Research News*, United States Department of Agriculture, Agricultural Research Service, October 29, 1992.
- ²⁹Doris Stanley, "Research Brings Transgenic Citrus a Step Closer," *Update*, United States Department of Agriculture, Agricultural Research Service, May 1993.
- ³⁰Hank Becker, "Mini-Iceberg Lettuces Offer Convenience, Crisp Texture, Sweet Taste," *Scientific Research News*, United States Department of Agriculture, Agricultural Research Service.
- ³¹"Get A Look at This Tomato's Promise of Ripe Profits," *Money*, July 1993.
- ³²*Quarterly Report on Selected Research Projects*, United States Department of Agriculture, Agricultural Research Service, July 1 to September, 1992.
- ³³Ibid.
- ³⁴George Kidd, "DNAP Takes the Lead in Genetic Subtraction," *Bio/Technology*, Vol. 11, August 1993.
- ³⁵Bob Davis and Gregory N. Racz, "Clinton to Slow Pace of Easing Biotech Rules," *Wall Street Journal*, March 31, 1993, p. B1.
- ³⁶Panfilo Tabora, Jr., "Central America and South America's Pacific Rim Countries: Experience with Export Diversification," *Trends in Agricultural Diversification: Regional Perspective*, World Bank Technical Paper Number 180 (Shawki Barghouti, Lisa Garbus, and Dina Umali, eds.).
- ³⁷"Brazil: Souza Cruz Closes Down Biotechnology Company," *Gazeta Mercantil*, May 24, 1991, p. 14.
- ³⁸Quantities are in hundred weights (CWT). Prices are in U.S. dollars.
- ³⁹Of the products studied, grapes and oranges have substantially longer storage and transport lives. Grapes have a one- to six-month storage and transport life and oranges can survive three to twelve weeks after harvest.
- ⁴⁰For a complete list of sources see Appendix 1.

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- ⁴¹The lull in late-summer shipments is probably a shortcoming of the data. Heavy roadside and small farm production during this time goes unrecorded by the USDA.
- ⁴²Latin American production data were not available for this product.
- ⁴³David Kaimovitz, *El Apoyo Tecnológico Necesario para Promover las Exportaciones Agrícolas No Tradicionales en América Central*, Instituto Interamericano de Cooperación para la Agricultura, July 1992.
- ⁴⁴There are no data for Californian cucumber shipments.
- ⁴⁵The rates seem to be consistent with other sources such as freight companies and various agricultural studies.
- ⁴⁶In the absence of reliable trade data from which to calculate transportation costs, transportation costs for a commodity were derived according to the methods specified in Appendix 3.
- ⁴⁷"Country Report: Argentina," *The Economist Intelligence Unit*, Second Quarter 1993.
- ⁴⁸*Ibid.*
- ⁴⁹David E. Hojman, *Chile: The Political Economy of Development and Democracy in the 1990's*, (University of Pittsburgh Press, 1993) p. 165.
- ⁵⁰*Ibid.*, p.166.
- ⁵¹*1991 Chilean Agricultural Situation Report*. A Report from the American Embassy in Santiago, Chile to the United States Department of Agriculture, Foreign Agriculture Service, July 1992.
- ⁵²*Ibid.*
- ⁵³Steven Jaffee, "Exporting High-Value Food Commodities, Success Stories from Developing Countries," *World Bank Discussion Paper #198* (Washington, DC 1993) p. 84.
- ⁵⁴"Country Report: Chile," *The Economist Intelligence Unit*, Third Quarter 1993 p.13.
- ⁵⁵"Chile: Rising Star of South American Exporters," *Farmlife*, U.S. Department of Agriculture, February 1992, pp. 4-5.
- ⁵⁶*Ibid.*
- ⁵⁷Report on Chile Economic Policy and Trade Practices, United States Department of State, 1992.

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- ⁵⁸*Chile Economic Report*, Corporacion de Fomento de la Produccion (CORFO), August 1993, p. 2.
- ⁵⁹*Ibid.*, p.2.
- ⁶⁰*Ibid.*, p.3.
- ⁶¹*Foreign Agriculture 1992*, Foreign Agricultural Service, United States Department of Agriculture, 1993.
- ⁶²“Chile: Rising Star of South American Exporters,” *Farmline*, U.S. Department of Agriculture, February 1992, p. 4-5.
- ⁶³*Chile Economic Report*, Corporacion de Fomento de la Produccion (CORFO), August 1993, p. 3.
- ⁶⁴Cohen and Gunter, eds, *The Colombian Economy*, pp. 89-90.
- ⁶⁵*Ibid.*
- ⁶⁶*Ibid.*
- ⁶⁷*Foreign Agriculture 1992*, U.S. Department of Agriculture, Foreign Agricultural Service, 1993.
- ⁶⁸*Ibid.*
- ⁶⁹Cohen and Gunter, eds., *The Colombian Economy*, (Westview 1992) p. 200.
- ⁷⁰*Ibid.*, p.172.
- ⁷¹*Ibid.*, pp.132-133.
- ⁷²*Colombia - Investment Climate Statement - ICS9210*, U.S. Department of Commerce, International Trade Administration, March 26, 1993.
- ⁷³Cohen and Gunter, eds., *The Colombian Economy*, (Westview 1992) p. 184.
- ⁷⁴*Ibid.*, p.198.
- ⁷⁵*Business America*, Vol. 113, No. 19; Sept. 21, 1992, p. 14.
- ⁷⁶*Foreign Agriculture 1992*, U.S. Department of Agriculture, Foreign Agricultural Service.
- ⁷⁷Samuel Rosa, “U.S. Horticultural Trade with the Caribbean Basin Initiative Beneficiary Countries, 1992,” *Horticultural Products Review*, U.S. Department of Agriculture, Foreign Agricultural Service, Circular Series FHORT 9-93, September 1993, p. 18.

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- ⁷⁸Von Braun, Hotchkiss and Immink, *Nontraditional Export Crops in Guatemala: Effects on Production, Income, and Nutrition*, International Food Policy Research Institute Research Report 73, May 1989, pp.24-29.
- ⁷⁹Panfilo Tabora, Jr., "Central America and South America's Pacific Rim Countries: Experience with Export Diversification," *Trends in Agricultural Diversification: Regional Perspective*, World Bank Technical Paper Number 180 (Shawki Barghouti, Lisa Garbus, and Dina Umali, eds.) p.98.
- ⁸⁰Thomas E. Schweigert, "Commercial Sector Wages and Subsistence Sector Labor Productivity in Guatemalan Agriculture," *World Development*, 21(1): 1993, p. 82.
- ⁸¹Von Braun, Hotchkiss and Immink, pp.24-29.
- ⁸²*Foreign Agriculture 1992*, United States Department of Agriculture, Foreign Agricultural Service.
- ⁸³Samuel Rosa, "U.S. Horticultural Trade with the Caribbean Basin Initiative Beneficiary Countries, 1992," *Horticultural Products Review*, U.S. Department of Agriculture, Foreign Agricultural Service, Circular Series FHORT 9-93, September 1993, p.19.
- ⁸⁴*Foreign Agriculture 1992*, U.S. Department of Agriculture, Foreign Agricultural Service.
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