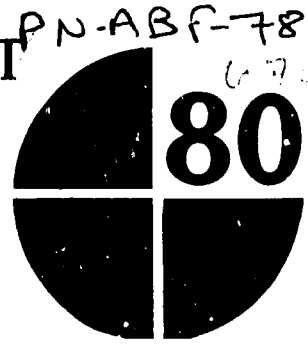
RESEARCH REPORT



HORTICULTURAL EXPORTS OF DEVELOPING COUNTRIES: PAST PERFORMANCES, FUTURE PROSPECTS, AND POLICY ISSUES

Nurul Islam

April 1990

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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Faced with increasing import requirements for accelerated growth, developing countries need to rapidly expand their export earnings. For most, agricultural exports constitute a major source of foreign exchange earnings. But traditional agricultural exports of developing countries, such as agricultural raw materials and tropical beverages, face slow growth prospects in world markets, and food exports, such as cereals, livestock products, and sugar, cannot compete with the subsidized exports of developed countries. In this context, the importance of identifying and promoting nontraditional exports with high growth prospects in world markets, such as horticultural exports, can hardly be overemphasized. Labor-abundant developing countries have or can rapidly develop comparative advantage in many horticultural exports. Moreover, the potential contribution of these products to agricultural diversification and employment expansion in developing countries is likely to be significant.

IFPRI has undertaken in the past specific studies of selected agricultural exports, including *Nontraditional Exports in Guatemala: Effects on Production, Income, and Nutrition*, Research Report 73, and *Constraints on Kenya's Food and Beverage Exports*, Research Report 44. However, little research has been done on world trade in horticultural products. This research report, which is the first comprehensive analysis of the world trade in horticultural products, includes their composition, market structure, past trends, and the role of price and nonprice factors, as well as an examination of the differential performances of developing countries and regions.

The study provides guidance on both domestic and international policy measures crucial for the realization of this dynamic sector. On the domestic front, developing countries need to strengthen their competitive position by intensifying research and development efforts on cost-reducing innovations in production, by expanding their domestic markets to realize economies of scale, and by developing efficient systems of packaging, processing, storage, transportation, and distribution.

Future export prospects also largely depend on the liberalization of trade restrictions in the developed countries. This emphasizes the critical role of the GATT negotiations now under way, especially for the liberalization of nontariff barriers, particularly the harmonization of widely divergent national sanitary and health regulations on imports.

Detailed country studies bearing on specific questions of product choice, technology, infrastructure institutions, and policy framework are needed in order to devise an appropriate strategy for the horticultural sector in developing countries.

John W. Mellor

Washington, D.C.
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Nurul Islam

1

SUMMARY

In recent years, policymakers, analysts, and development specialists have expressed broad interest in the potential contribution of horticultural products to agricultural diversification, employment expansion, and foreign exchange earnings in developing countries. Yet little research has been done on world trade in horticultural products or on the production, marketing, and export of such products in developing countries. The data available—published or unpublished—on international trade in horticultural products as a whole or individually are limited. This report seeks to contribute to this small fund of knowledge a comprehensive analysis of world trade in fruits and vegetables (excluding such products as cut flowers, foliage, potted plants, and nursery materials), with special emphasis on the exports of developing countries. About 150 products are covered over a period of 25 years.

Given their importance, it is surprising that horticultural products have been neglected or underestimated in the past. The share of horticultural exports in world agricultural trade has risen over the years; by 1983-85, horticultural products constituted about 12 percent of world agricultural trade, next in importance to cereals, livestock products, and oilseeds, fats, and oils. At 13 percent, horticultural exports were the third largest category of agricultural exports in developing countries in 1983-85. They followed oilseeds, fats, and oils and were more important than agricultural raw materials and sugar. For a number of individual countries, horticultural exports' share of agricultural exports was more than 25 percent. Developing countries' share of world horticultural exports continued to increase during 1975-85, when the rate of growth of world horticultural trade slowed; by 1983-85, it was 37 percent, with an absolute value of US$9 billion.

The developed countries provided the largest import market, accounting for 83 percent of world imports of horticultural products during 1983-85. The developing countries' share of world import demand—17 percent—was an increase from 14 percent in 1975-77. Fast-growing import markets during 1975-85 were the United States and Japan, although the rate of growth of Japanese imports slowed compared with 1965-75. Although Western Europe had the lowest rate of growth of imports during 1975-85, it remained the largest import market in absolute size: even excluding inter-European trade, it was still about 80 percent larger than the United States market. However, the largest part of world trade in horticultural products was carried on between the developed countries themselves. They obtained 72 percent of their horticultural imports from other developed countries and sent 80 percent of their exports to these countries during the early 1980s. The developing countries sent about 20 percent of their exports to other developing countries.

The product composition of world horticultural exports has changed over time, with an increase in the relative importance of fruits since 1975. By 1983-85, fruits constituted 70 percent of the total horticultural exports of developing countries. Also, the unit value of fruits was higher than that of vegetables, and it grew faster. The developing countries' share of world exports of fruit was 42 percent in 1983-85, whereas their share of vegetables was 28 percent. At the same time, the share of processed products, especially processed vegetables, in the exports of developing countries went up. The value added in the processing of fruits and vegetables was consid-

erable. The unit value of processed fruits was three-and-one-half times higher than that of fresh fruits, whereas the unit value of processed vegetables was twice as high as for fresh vegetables.

A variety of products were internationally traded: the most important fresh fruits were oranges, other citrus fruits, and bananas, while mangoes and avocados were the fastest-growing tropical products. Fruit juices, both tropical and nontropical, were the leading exports in the processed fruits category. The developing countries also increased their share of exports of potatoes and miscellaneous vegetables, of which tomatoes constituted 30 percent. Most products that were in competition with developed countries gained a larger share of the world market during the period 1975-85.

A limited number of developing countries dominated horticultural exports. Twelve countries accounted for 22 percent of the world market and 65 percent of the exports of developing countries in 1983-85. There was stiff and aggressive competition between them, and their relative shares of world trade shifted from time to time. The limited number of competitive countries was explained partly by the agroecological characteristics of individual countries and partly by the limited size, in many cases, of the total world market for individual commodities. No less important were obstacles to entry into export markets that resulted from the specialized nature of the export-related infrastructure, including strict quality and health standards, as well as established consumer preferences for specific products in particular markets. For products with a value of US$50 million or more, four leading exporters, each having a share of at least 5 percent of the total developing-country exports of that commodity, accounted for about 80 percent or more of the exports.

Trade restrictions in the industrial countries, including tariff and nontariff barriers, constrained the growth of exports. Fresh vegetables were subject to higher duty rates—an average of 9 percent—than fresh fruits, which averaged 5 percent, while rates of 15 percent for processed fruits and 12 percent for processed vegetables were imposed. These rates escalated with the degree of processing. Tropical horticultural products in general had lower rates of duty. The nontariff barriers were, on the whole, higher for fruits than for vegetables, with the differences between import and domestic prices ranging from 22 to 180 percent for fruits and from 30 to 80 percent for vegetables. In general, both tariff and nontariff trade restrictions were higher in Japan and the European Community than in the United States, except for processed fruits.

The success of the multinational trade negotiations under the General Agreement on Tariffs and Trade (GATT) is essential for an effective liberalization of trade in horticultural products. The tropical horticultural products are expected to receive special and early consideration in the negotiations in view of their importance to developing countries and the lack of serious competition with exports or domestic production of developed countries.

Concerning nontariff barriers, considerable importance is being attached to an international agreement under the auspices of the GATT on national sanitary standards and regulations. This should help promote harmony among importing countries and also provide a system for international surveillance, which, combined with dispute settlement procedures under GATT, should preclude possible trade-distorting effects.

Estimates of the increase in export earnings that developing countries could achieve from the elimination of trade restrictions in the European Community, the United States, and Japan vary between 6 and 9 percent over the value of exports in 1983-85, that is, between US$570 million and US$850 million. Similarly, estimates of the gains in export earnings from removal of nontariff barriers range between 24 and 36 percent, or US$2-3 billion. This is on the basis of assumed elasticities of export supply and

import demand varying between 0.5 and 1.0. A large part of the additional earnings is expected to result from an increase in the world price, rather than in the volume of exports. In view of the low import penetration ratio for many horticultural products—that is, the low ratio of imports to domestic production (no more than 10 percent for horticultural products in general in any of the three major developed regions)—a significant liberalization of trade is unlikely to have any appreciable effect on domestic production.

Future prospects of horticultural exports of developing countries will depend predominantly on the growth of import demand, mostly in the developed countries. Given the high per capita consumption of fruits and vegetables today and the projected slow rates of growth of income and population in developed countries, the annual rate of growth in their aggregate domestic demand is unlikely to exceed 1.31 percent for fruits and 1.08 percent for vegetables between now and the year 2000. However, the ratio of imports to aggregate domestic demand in developed countries is estimated to increase by 28 percent for fruits and 45 percent for vegetables between now and 2000. Developed countries are expected to diversify their food consumption patterns, including consumption of horticultural products, in the future. This heightened concern with health and nutrition and familiarity with more fruits and vegetables because of wider availability, increased travel, and improved communications, will lead to an increase in the ratio of imports to domestic products in total demand. Differences in per capita consumption of fruits and vegetables among developed countries with similar patterns and levels of living may also indicate a potential for increases in import-oriented consumption in countries where consumption is relatively low at the present time.

The developing countries' share of the world import market is estimated to increase from 17 percent to only 20-23 percent by the year 2000, even though the estimated future rate of growth of domestic demand is much higher in developing countries than in developed countries. The contribution of intradeveloping-country trade to an increase in their export earnings is also likely to be small because both the volume of their current imports and the expected future import ratio are low. The same is true of the centrally planned economies; their share of world imports is estimated to increase from 6.6 percent to only 7.7 percent unless their import policy is liberalized and their per capita consumption, especially of citrus and tropical fruits, goes up significantly.

Total developing-country exports of horticultural products are estimated to increase at rates ranging from 1.6 to 3.4 percent a year and to amount in absolute value to US$12-15 billion in 1983-85 prices by the year 2000.

Export performance differs widely among countries. Limited and scattered evidence suggests that, in addition to variations in agroecological endowments, differences in labor-land productivity resulting from research and development efforts and particularly in the state of export-related infrastructure are important.

The organization of an effective system of packaging, processing, storage, transportation, and distribution, both nationally and internationally, is crucial to success in horticultural exports. Economies of scale benefit these activities by reducing their costs significantly, and this price advantage helps promote exports.

Different horticultural products have varying degrees of labor-factor intensity; therefore countries must choose appropriate commodities to take advantage of their labor endowment, including skilled labor. Also, labor intensity differs for the same product from one country to another. Ongoing research efforts in developed countries are devoted to offsetting their rising labor costs. Developing countries need to design appropriate techniques and to organize production in ways that will facilitate the linking of large-scale marketing and distribution channels with small farmers in order to take

advantage of their comparatively low labor costs.

For successful export performance, a country must be first in the field, and it must carefully nurture its markets to attract consumer preferences toward its products. In addition, a large domestic market often provides both a springboard for the growth of exports and a cushion to absorb the shocks or uncertainties of export markets, except in the case of products exclusively produced for and sold in export markets.

Macroeconomic policies, especially trade and exchange rate policies that generally favor the export orientation of an economy, also help promote horticultural exports.

Detailed individual country studies are needed to analyze the factors, some agro-ecological and some manmade, that affect the production and exportation of horticultural products in specific circumstances. The lessons learned from their experiences will help identify the most important factors relating to institutions, technologies, and policies that contribute to an efficient horticultural sector and its success in export markets.

2

INTRODUCTION

In recent years, there has been a great deal of interest among both policymakers and trade analysts in the role of horticultural products as a principal means of agricultural diversification and foreign exchange earnings in developing countries.[1] Horticultural products have a high income elasticity of demand. As income goes up, demand rises rapidly, especially in middle and high-income developing countries, although demand is also rising in developed countries. A growing concern for health and nutrition has caused consumer preferences to shift from high-fat, high-cholesterol foods, such as meat and livestock products, to low-fat, low-cholesterol foods, such as fish, fruits, and vegetables. Also, there is an increasing tendency in developed countries to diversify the diet by consuming a wider variety of fruits and vegetables, a change partly stimulated by the increase in international travel and communications. This in turn has led to and is facilitated by increasing imports of new and nontraditional horticultural products, especially from the tropical developing countries.

Conditions for increasing production are likely to be favorable in developing countries. This is partly because horticultural products in general are labor-intensive. Developing countries with abundant labor in relation to capital or land enjoy a comparative advantage in labor-intensive horticultural products, as against, for example, cereal products, which require more land in relation to labor and other inputs for efficient production. The growth prospects for exports of horticultural products are therefore favorable for developing countries. Horticultural products not only have good potential for generating employment in cultivation but also in processing, marketing, and distribution. And they are frequently produced on small farms, thus providing an important source of additional income for poor farmers in developing countries. There are many horticultural products, especially fruits, that fetch high prices in world trade. Thus the efficient production of high-value horticultural products on small farms can help alleviate rural poverty.

The growing interest in horticultural exports in developing countries also reflects their search for diversified nontraditional agricultural exports in order to expand foreign exchange earnings so that they can meet rising import requirements for accelerated economic growth and mounting debt service payments.

During the period 1961-85, which is considered in this study, the volume of agricultural exports grew at a rate of 2.1 percent, but imports grew by 5.8 percent, even though the rate of growth of exports accelerated during 1980-85 and imports did not grow at all. Developing countries were under pressure to expand exports and compress imports in order to meet acute balance-of-payments problems. The expansion

[1] Horticultural products, in the context of this study, include fruits and vegetables as defined in the Standard International Trade Classification (SITC). Cassava is not included, but potatoes and other minor roots and tubers are. This definition also excludes such products as cut flowers, foliage and potted plants, and nursery materials. Therefore, the classification is based on the following SITC categories: 051 (fruits, fresh, and nuts, fresh or dried), 052 (dried fruits), 053 (fruit, preserved, and fruit preparations), 054 (vegetables, fresh, frozen, or simply preserved; roots, tubers, and other edible vegetable products not elsewhere specified [n.e.s.], fresh or dried), 055 (vegetables, roots and tubers, preserved or prepared, n.e.s., whether or not in airtight containers).

of the volume of exports was accompanied in many cases by a fall in export prices and a slowing of growth in the value of exports. The unit value of exports fell at a rate of −1.5 percent per year during the 25-year period.

Many of the traditional exports of developing countries, such as tea, coffee, and cocoa, as well as agricultural raw materials such as jute, sisal, and tobacco, have been growing rather slowly, and they are unlikely to accelerate in the future. Some are faced with low price and income elasticities of demand, especially in developed countries. At the same time, exports such as sugar, livestock products, dairy products, oilseeds and oils, and pulses, face strong competition from the often-subsidized exports of developed countries.

This study seeks to determine how fast the world trade in horticultural products has grown over the past decades and to what extent the developing countries have participated in this expanding trade. It raises a number of questions in this respect. Who were the major successful exporters and in which commodities were they able to expand their exports? What was the nature of the world market in particular horticultural products? Was the market competitive, with a large number of sellers, or was it narrow and thin, with only a few exporters? Did the developing countries face much competition from developed countries in the market for horticultural products? Where were the principal markets for horticultural exports of developing countries? Was demand growing faster in developing countries than in developed countries? Was there a pattern of regional specialization among the principal horticultural exporters? Were there some discernible characteristics that contributed to the success of some countries and not others? What are the future prospects for horticultural exports? How severe are the barriers to trade they face in developed-country markets? What are the possible consequences of a liberalization of trade in the principal industrialized countries? What policy issues are relevant in formulating a strategy for the horticultural exports of developing countries?

Relative Importance of Horticultural Exports in Agricultural Trade

In analyses of world agricultural trade, not much attention has been paid to horticultural products, even though they have emerged as a major commodity group in recent years. The composition of world agricultural exports and those of developing countries during 1983-85 is shown in Table 1. Cereals and livestock products constitute the two most important groups in world trade, together about 34 percent of world agricultural exports. At 12 percent, horticultural exports (fruits and vegetables) follow closely behind oilseeds, fats, and oils, which are next in importance to cereals and livestock products. Among developing countries, horticultural exports are more important than agricultural raw materials and sugar and again follow oilseeds, fats, and oils in importance.

During the period 1965-85, the relative importance of horticultural products in world agricultural exports rose. During the first decade, world horticultural exports grew at a rate slightly below that of world agricultural exports, but in the second decade, their rate of growth exceeded that of agricultural exports. For developing countries, horticultural exports grew at a significantly higher rate than agriculture as a whole during the second decade (Table 2). In developed countries, however, the importance of horticultural exports declined throughout the period.

Although all agricultural exports, including horticultural, slowed during the second period, the growth rate of horticultural exports declined by a smaller margin than did

Table 1—Composition of agricultural exports, developing countries and world, 1983-85

Commodity Group	Developing Countries	World
	(percent)	
Tropical beverages and tobacco	24	10
Oilseeds, fats, and oils	15	13
Fruits and vegetables	13	12
Other commodities	12	20
Sugar	11	5
Raw materials	10	6
Cereals	8	17
Livestock products	7	17

Source: Food and Agriculture Organization of the United Nations (FAO), "Trade Yearbook Tape, 1985," FAO, Rome, 1986.

total agricultural exports, especially in developing countries. Furthermore, while the rate of growth of horticultural exports in developing countries was lower than that in developed countries during the first decade, it was about 40 percent higher during the second decade.

Another way of looking at the importance of horticultural exports relative to the other groups of agricultural exports of developing countries is to compare the absolute changes in the average annual values of various groups of exports (Table 3). These changes were positive for horticultural exports, whereas changes for all other single groups of agricultural exports were negative in at least one period. Moreover, the increase in the average annual value of horticultural exports compared favorably with those of other groups of agricultural exports, singly or in combination. During the first period, the annual increment of horticultural exports was significantly higher than that of sugar and tropical beverages combined or of sugar, tropical beverages, and agricultural raw materials combined. During the second period, the annual increment in horticultural exports was much higher than that of the combined values of three other agricultural exports, but less than that of the combined values of sugar and tropical beverages.

Table 2—Average growth rates of horticultural exports and all agricultural exports, 1965-75 and 1975-85

Exports/Period	World	Developed Countries	Developing Countries
		(percent)	
Horticultural exports			
1965-75	11.11	11.86	9.65
1975-85	6.44	5.50	8.26
Agricultural exports			
1965-75	12.55	13.90	10.15
1975-85	5.66	5.90	5.17

Source: Food and Agriculture Organization of the United Nations (FAO), "Trade Yearbook Tape, 1985," FAO, Rome, 1986.

Table 3—Absolute changes in the average annual value of exports, 1977-85

Commodity Group	1977-79 to 1980-82[a]	1980-82 to 1983-85[a]
	(US$ million)	
Sugar	+ 3,017	- 1,149
Tropical beverages	- 2,179	+ 1,355
Agricultural raw materials	- 281	- 177
Sugar and tropical beverages combined	+ 835	+ 206
Sugar, tropical beverages, and agricultural raw materials combined	+ 557	+ 29
Horticultural products	+ 2,529	+ 85

Source: Based on data from Food and Agriculture Organization of the United Nations (FAO), *Commodity Review and Outlook*, various issues.

[a]Three-year averages are used to iron out the effects of year-to-year fluctuations. Annual average figures for 1977-79 are compared with those for 1980-82; annual average figures for 1980-82 are compared with those for 1983-85.

Horticultural Exports of Developing Countries

During 1983-85, horticultural exports constituted about 12 percent of total world agricultural exports, amounting in value to about US$24.8 billion. The share of horticultural exports in total agricultural exports of the developing world continued to increase from about 9 percent in 1961-63 to 13 percent in 1983-85, with a slight decline between 1970-72 and 1975-77.

Meanwhile, the developing countries' share of world horticultural exports increased from 33 percent during 1961-63 to 37 percent during 1983-85. In fact, the share remained more or less constant from 1961-63 to 1975-77; the principal increase took place between 1975-77 and 1983-85. Two points need to be emphasized. First, the share of developing countries in world horticultural exports expanded even when the rate of growth of world horticultural trade slowed during the second decade. Second, the share of developing countries in world horticultural exports increased, while their share in world agricultural exports as a whole declined (Table 4).

Among the developing countries, Latin America was by far the most important region, accounting for 16 percent of world horticultural exports and 44 percent of the agricultural exports of developing countries (Table 5).[2] Near East and Far East were the next most important exporting regions in that order, each accounting for about 7 percent of world horticultural exports. Africa had the smallest share, about 3 percent, although it held 8 percent of the world market in 1961-63. While the share of all the other regions increased over time, Africa's declined; between 1975-77 and 1983-85, the nominal value of Africa's horticultural exports also declined slightly. The two regions with an accelerated rise in their market share, especially during 1975-77 and 1983-85, were Latin America and Far East: their horticultural exports increased faster than the average rate for all developing countries, with Latin America having a slight edge over Far East.

The percentage of horticultural exports in total agricultural exports in Latin America rose from 8 percent in 1961-63 to 13 percent in 1983-85 and in Near East from 18 percent to 35 percent. Far East also increased its share of horticultural products from 5 percent to 9 percent, though the absolute value of its horticultural exports was less

[2] A list of the developing countries included in each region is presented in the notes to Table 5.

Table 4—Developing countries' share of horticultural and agricultural exports, 1961-85

Share	1961-63	1975-77	1983-85
		(percent)	
Share of developing countries in world horticultural exports	33.17	32.04	36.68
Share of horticultural in total agricultural exports of developing countries	8.94	10.44	13.03
Share of developing countries in world agricultural exports	41.00	34.20	33.00

Sources: Food and Agriculture Organization of the United Nations (FAO), "Trade Yearbook Tape, 1985," FAO, Rome, 1986; and data on horticultural products compiled by the author from various FAO sources.

Table 5—Value and share of agricultural and horticultural exports of developing countries, by region, 1983-85

Developing Countries/ Region	Agricultural Exports	Horticultural Exports	Horticultural Exports		
			Share of World Horticultural Exports	Share of Total Agricultural Exports	Rate of Growth, 1975-85
	(US $ billion)		(percent)		
All developing countries, including Asian centrally planned economies	69.7	9.1	36.7	13.0	8.3
Asian centrally planned economies	5.5	1.1	4.6	20.5	6.8
Developing market economies	64.2	8.0	32.1	12.4	8.6
Africa	8.5	0.6	2.6	7.5	-0.1
Latin America	30.9	3.9	15.6	12.5	10.8
Near East	5.2	1.8	7.3	35.3	7.2
Far East	19.1	1.6	6.6	8.6	10.2
Other developing market economies	0.5	0.1	0.0	1.6	5.8

Source: Food and Agriculture Organization of the United Nations (FAO), "Trade Yearbook Tape, 1985," FAO, Rome, 1986; and data on horticultural products compiled by the author from various FAO sources.

Notes: The following countries are included in each region. Africa: Algeria, Angola, Benin, British Indian Ocean Territory, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, St. Helena, Sao Tomé and Principe, Senegal, Seychelles, Sierra Leone, Somalia, Spanish North Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zaire, Zambia, and Zimbabwe.

Far East: Bangladesh, Bhutan, Brunei, Burma, East Timor, Hong Kong, India, Indonesia, Republic of Korea, Laos, Macau, Malaysia, Maldives, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, and Thailand.

Latin America: Anguilla, Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Falkland (Malvinas), French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, St. Christopher and Nevis, St. Lucia, St. Vincent Grenadines, Suriname, Trinidad and Tobago, Turks and Caicos Islands, U. S. Virgin Islands, Uruguay, and Venezuela.

Near East: Afghanistan, Bahrain, Cyprus, Egypt, Gaza Strip (Palestine), Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, Sudan, Syria, Turkey, United Arab Emirates, Yemen Arab Republic, and Yemen Democratic Republic.

Asian centrally planned economies: China (excluding Taiwan), China (Taiwan province), Kampuchea (Democratic), Korea (Democratic People's Republic), Mongolia, and Viet Nam.

Table 6—Ratio of exports to domestic output in horticultural products and growth rates of production and exports, developed and developing countries, 1961-85

Country Group	Share of Domestic Output Exported			Production Growth Rate		Export Growth Rate	
	1961-63	1975-77	1983-85	1965-75	1975-85	1965-75	1975-85
				(percent)			
Developed countries, including Eastern Europe and U.S.S.R.	3.36	5.36	6.29	0.42	0.45	3.49	2.85
Developing countries, including Asian centrally planned economies	2.58	2.84	2.92	3.24	2.02	3.59	2.93

Source: Data on horticultural products compiled by the author from various FAO sources.

than 50 percent of that of Latin America and 10 percent less than that of Near East in 1983-85. In agricultural exports, Latin America was the largest exporter followed by Far East, Africa, and Near East in that order.

The increase in world horticultural exports resulted partly from an increase in the domestic production of horticultural products and partly from a rise in the share of domestic output that was exported. Developed countries diverted an increasingly larger proportion of their domestic output to the export market than did developing countries. The share of domestic output exported in developed countries was almost double that in developing countries. The main source of growth in exports in developing countries was the rise in domestic output.

The growth rates of both domestic production and exports were higher in developing countries than in developed countries (Table 6). Rapidly rising domestic demand in developing countries was met by rapidly rising domestic production; the proportion of output that was exported was low. As the growth rate of production in developing countries slowed during the second decade, the growth rate of exports also slowed.

Increasing production and export of horticultural products were not, however, accompanied by a rising share of horticultural output in either food production or total agricultural production. The growth rates of food and total agricultural production were higher than that of horticultural production in both developed and developing countries (Table 7). The change in the composition of global demand in favor of horticultural products, both domestic and exported, was not strong enough to cause a rise in the share of horticultural production in total agricultural or food production.

Table 7—Annual growth rates of production, developed and developing countries, 1975-85

Country Group	Horticultural Production	Food Production	Agricultural Production
		(percent)	
Developed countries, including Eastern Europe and U.S.S.R.	0.45	1.45	1.40
Developing countries, including Asian centrally planned economies	2.02	3.28	3.32

Source: Data on horticultural products compiled by the author from various FAO sources.

3

MAJOR PRODUCTS, EXPORTERS, AND MARKETS

In 1983-85, fruits composed 61 percent of the horticultural exports of the world and 70 percent of those of developing countries. Fruits have become relatively more important in recent years, as evidenced by the higher average annual growth rate for exports of fruits than of vegetables in 1975-85 compared with 1965-75.

	Fruits		Vegetables
1965-75		(percent)	
Developing countries	6.57		11.39
World	10.29		12.53
1975-85			
Developing countries	8.51		7.67
World	8.97		6.25

Developing countries had a larger share of the world trade of fruits than of vegetables.

	1961-63	1975-77	1983-85
		(percent)	
Fruits	38	37	42
Vegetables	24	25	28

The share of processed products in both total world and developing-country horticultural exports increased during the period; by 1983-85, at least half of total horticultural exports were processed.

	1961-63	1975-77	1983-85
		(percent)	
World	38	44	50
Developing countries	33	47	52

Also, the share of processed vegetables in total exports of vegetables (53 percent for the world and 60 percent for developing countries) was higher than the share of processed fruits in total exports of fruits (45 and 43 percent). It is more difficult to transport fresh vegetables than fresh fruits over long distances without damage, given present systems for handling, packaging, and transporting.

In comparing the unit values of fresh, processed, and combined products in Table 8, a number of differences are evident. First, the values per ton of processed horticultural exports, both fruits and vegetables, were higher than those of fresh products, and the trend was upward over time. Second, the values of both fresh and processed fruits were generally higher than those of vegetables. Third, the differences between the

Table 8—Export unit values of horticultural products, 1983-85

Type of Production/ Country Group	Fruits	Vegetables
	(US$/ton)	
Fresh		
Developed countries	437	335
Developing countries	305	284
Total	368	315
Processed		
Developed countries	839	550
Developing countries	1,063	588
Total	919	560
Fresh and processed combined		
Developed countries	559	417
Developing countries	440	396
Total	502	411

Source: Data on horticultural products compiled by the author from various FAO sources.

values of fresh and processed vegetables were smaller than those between fresh and processed fruits. Therefore, the value added and export earnings per ton of processed fruits were higher. Fourth, the values of processed exports were higher than those of fresh for both fruits and vegetables by a wider margin in developing countries than in developed countries. The developing countries seemed to generate a higher value added per unit of processed exports than the developed countries.

The rate of increase in the unit value of vegetable exports declined significantly during 1975-85, whereas the unit value for fruits increased in developing countries (Table 9), which suggests a faster expansion in demand for fruits than for vegetables relative to supply. Growth in the quantity of fruits exported slowed, while that for vegetables accelerated. In fact, during the second decade, the rate of increase in vegetable exports was much higher (5.4 percent) than that in fruits (1.9 percent).

Detailed Composition of Fruit Trade

There are about 84 different fruits or groups of fruits traded in the world market. During 1983-85, 42 items—each with a value of US$50 million or more—amounted

Table 9—Annual growth rates of unit value and quantity of horticultural exports, 1965-75 and 1975-85

Commodity/Growth Rate	World		Developing Countries	
	1965-75	1975-85	1965-75	1975-85
		(percent)		
Fruits				
Unit value growth	6.3	4.6	4.9	6.4
Quantity growth	3.8	1.8	3.9	1.9
Vegetables				
Unit value growth	9.2	1.8	8.4	2.1
Quantity growth	3.0	4.4	3.9	5.4

Source: Data on horticultural products compiled by the author from various FAO sources.

to US$14.6 billion (96 percent of the total world trade in fruits), whereas another 42 items—each with a value of less than US$50 million—amounted to a total of US$620 million. Developing countries participated extensively in the world trade of fruits, and their trade was not confined to a few items, although shares of the trade of different items varied widely among countries, and their share in the world market of many items fluctuated over time. During 1983-85, there were only seven fruits that developing countries did not trade. A comparison of exports between 1961-63 and 1983-85 shows that developing countries began trade in many new products between the two periods. Not only did they export new items, but they also consistently increased their share of at least 20 items during the period (see Appendix 1, Tables 40 and 41).

Among the fresh fruits in world trade, the largest category in 1983-85 was that of miscellaneous fruits, followed by oranges and other citrus fruits and bananas. Among the processed fruits, the largest single category was other nontropical fruits. There were 21 different fresh fruits in the miscellaneous category. Although their share of trade increased over time, the absolute value of world exports of some of them was very small.

In the developing countries' share of the fresh fruit market, bananas remained more or less the same during the whole period and oranges rose only slightly (Table 10). The share of tropical fruits declined and miscellaneous fruits rose. The individual export items in the order of their importance were as follows: bananas, 37 percent; oranges, 12 percent; grapes, 6 percent; apples, 6 percent; hazelnuts, 5 percent; raisins, 5 percent; desiccated coconuts, 4 percent; dates, 3 percent; tangerines, 3 percent; lemons and limes, 2 percent; and grapefruits, 2 percent. Developing countries either maintained or increased their share of trade in all of these fruits over time.

Developing countries are expected to have comparative advantage in tropical fruits and, therefore, to perform well in the export market.[3] But tropical fruits constituted no more than 5.9 percent of total world trade in fresh fruits in 1983-85, increasing from 2.8 percent in 1961-63 and 3.3 percent in 1975-77. This indicates that until recently the demand for tropical fruits in industrialized countries has been limited. However, familiarity with tropical fruits is growing in developed countries as the result of, first, an increase in international travel; second, an increase in immigrants from tropical developing countries, who have created a demand for tropical foods; and third, rising affluence in developed countries, which has fostered a desire for diversification of food consumption patterns and thus a trend toward the more exotic fruits. As a result, supermarkets in developed countries are beginning to stock an increasing number of tropical fruits. However, the relative importance of tropical fruits in the world trade of fresh fruits remains very small.

Despite the recent increase in demand for tropical fruits, the share of developing countries in the world trade in tropical fruits has declined due to an increase in exports from a few developed countries that have within their territories tropical agroecological zones. The two most important categories of tropical fruit exports in which developing countries have suffered a declining trade share are mangoes and miscellaneous tropical fruits; they constituted 11 percent and 17 percent, respectively, of all tropical fruit exports during 1983-85. The share of developing countries in world trade of mangoes declined from 95 percent to 89 percent between 1975-77 and 1983-85, while that of the miscellaneous group declined from 56 percent to 39 percent (Appendix 1, Table

[3] Included in the category of tropical fruits are mangoes, pineapples, dates, persimmons, papayas, avocados, and other fresh tropical fruits. Bananas and plantains are classified separately (FAO 1987b, FAO 1985b).

Table 10—Share of developing countries in world trade of fruits and annual growth rates, 1961-85

Fruits	Share of World Trade			Rates of Growth			
				World		Developing Countries	
	1961-63	1975-77	1983-85	1965-75	1975-85	1965-75	1975-85
				(percent)			
Fresh	44	39	43	9.6	7.7	5.5	6.9
Bananas	94	93	94	5.2	6.7	5.1	6.7
Oranges and other citrus fruits	30	28	32	9.8	4.6	9.1	6.6
Tropical fruits	82	66	59	11.8	13.3	11.3	11.7
Miscellaneous fruits	16	16	22	11.4	5.4	9.7	10.0
Treenuts	75	76	70	9.8	9.9	3.2	1.8
Processed	27	33	41	11.9	11.7	8.1	11.2
Nontropical juices	14	23	48	21.0	13.9	21.9	24.6
Tropical juices	25	66	60	9.5	19.2	14.9	17.8
Other nontropical fruits	17	24	27	10.0	4.9	13.6	6.6
Other tropical fruits	69	85	87	8.0	4.7	8.6	5.1
Treenuts	42	43	41	10.4	8.0	9.2	7.7
Total fruits	38	37	42	10.3	9.0	6.6	8.5

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: The fruits and products in each category are listed in the tables in Appendix 1.

40).[4] There were three specific tropical fruits—papayas, avocadoes, and dates—in which they increased their share in world trade, significantly for the first two items.

The rate of growth of all tropical fruits, except dates, continued to be high—much higher than the rate of growth of fresh fruits as a whole—partly because of their low value in the base year. With the exception of dates and papayas, the rates of growth in world trade of tropical fruits during 1975-85 ranged from 11 to 31 percent, indicating that it is possible to expand exports from developing countries, even to increase their share in world trade, if supply at competitive prices can be assured. The fastest growing tropical fruits in world trade are mangoes, avocados, and miscellaneous tropical fruits.

The fastest growing items in world trade of processed fruits in 1983-85 were fruit juices, both tropical and nontropical, which constituted 33 percent of total world trade in processed fruits in 1983-85. The share of developing countries in combined exports of tropical and nontropical fruit juices more than doubled between 1975-77 and 1983-85: developing-country shares by 1983-85 were 60 percent in tropical juices and 48 percent in nontropical. Between 1975-77 and 1983-85, exports of nontropical fruit juices from developing countries increased by 24 percent a year, compared with an annual rate of increase of 14 percent in world exports of nontropical fruit juices. Thus developing countries were able to capture an increasing share of an expanding market.

Among the nontropical juices, the most important items were orange and tangerine juices. World trade in these juices increased three-and-one-half times between the two periods, and developing countries maintained or increased their share. Developing countries already had a high share of trade in tropical juices in 1975-77 at 66 percent,

[4] Re-export of a few of these items may also have contributed to the fall in the share of developing countries.

but, although their exports of tropical juices increased at a rate of 18 percent a year between 1975-77 and 1983-85, their share declined to 60 percent, primarily because of a fall in their share of the pineapple juice trade.

In processed fruits other than fruit juices, both tropical and nontropical, developing countries increased their share between 1975-77 and 1983-85, even though their initial share of tropical processed fruits was already as high as 85 percent in 1975-77.

Detailed Composition of Vegetable Trade

There were 63 items or groups of vegetables that were traded in world markets during 1983-85, and developing countries exported all items but six. Thirty-three items, each worth US$50 million or more in world trade, constituted 95 percent of the total value of world trade in vegetables in 1983-85. Another 30 items, each less than US$50 million in value, accounted for about 5 percent of world trade. Developing countries consistently gained in their share of the market in 29 items between 1961-63 and 1983-85. In no item was there a consistent loss of share, although trade in several items fluctuated between periods (Table 11).

Among fresh vegetables, the miscellaneous vegetable category had the largest share in the value of world exports—75 percent—followed by roots and tubers at 20 percent. More than 90 percent of roots and tubers were potatoes.[5] At 28 percent, tomatoes were the most important single item in the miscellaneous vegetables category. Another 31 percent were distributed as follows: lettuce (8 percent), cucumbers (8 percent), chilies and peppers (6 percent), cabbages (3 percent), cauliflower (3 percent), and carrots (3 percent). Even though there was a decline in the growth rate of world trade in fresh vegetables overall, world trade in miscellaneous vegetables still enjoyed a higher-than-average rate of growth. During the second decade, the developing countries' share

Table 11—Share of developing countries in world trade of vegetables and annual growth rates, 1961-85

Vegetables	1961-63	1975-77	1983-85	Rates of Growth: World 1965-75	World 1975-85	Developing Countries 1965-75	Developing Countries 1975-85
				(percent)			
Fresh	22	20	23	10.2	5.1	7.1	7.5
Roots and tubers	19	16	24	10.1	1.1	9.0	6.0
Hops	...	...	3	8.6	8.9	-10.9	91.0
Miscellaneous vegetables	25	22	25	10.4	6.3	6.7	7.9
Processed	26	31	32	15.2	7.3	15.4	7.8
Roots and tubers	82	10	3	18.9	18.9	2.4	3.0
Pulses	51	52	49	10.6	8.2	10.0	7.0
Miscellaneous vegetables	10	24	27	17.4	6.5	23.1	8.4
Total	24	25	28	12.5	6.3	11.4	7.7

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: The ellipses indicate less than 1 percent.

[5] Cassava is not included in roots and tubers.

of roots and tubers increased, although world trade in potatoes declined.[6] Of the 28 items included in miscellaneous fresh vegetables, the developing countries either maintained or increased their share of world trade in most of them during the period (Appendix 1, Table 42 and 43).

Among the processed vegetables, miscellaneous vegetables constituted 70 percent of total world trade, with pulses accounting for 25 percent and roots and tubers 5 percent during 1983-85. The developing countries consistently increased their share of world trade in the processed miscellaneous vegetables.

Changing Shares of Developing Countries in World Trade

Although developing countries achieved high rates of growth in exports of many products that were experiencing rapid growth in the world market, export growth in the developing countries was not necessarily correlated with growth in the world market. Among the fruits and vegetables with high rates of growth in world trade, developing countries gained in some and lost in others. For example, out of 11 vegetables with growth rates of 10 percent or more on the world market in 1975-85, developing countries lost in 4 and gained in 7. Similarly, out of 11 fruits that attained rates of growth of 10 percent or more on the world market, developing countries lost in 5 (Table 12).

A number of factors, bearing on both the export supply and the demand for individual commodities, affect the developing countries' share of world trade. An expanding world market expands the demand for exports and reduces the intensity of competition with other suppliers. But a country's prevailing market share is also important. The higher the existing share of world trade, the greater the difficulty in increasing it further. A high market share means that a country has already substantially exploited its comparative advantage, and it can only be further strengthened by improving quality or reducing cost. In an expanding market, there is upward pressure on prices; hence it is easier to achieve a rise in market share. Exploitation of the increased opportunity, however, depends on competitive production costs and marketing efficiency. In a shrinking market, there is downward pressure on the market price; an expanding share in a shrinking market can only be attained through substantial cost-reducing innovations.

Research and development directed to horticultural products in developing countries was limited and not well-organized—not at all comparable to the research efforts devoted to cereals or agricultural raw materials or tropical beverages. At the same time, however, technological progress in developed countries was considerable and strengthened in recent years by biotechnological research (Moulton et al. 1986). The comparative advantages of the developing countries resided, first, in lower wage costs in products for which mechanization was not cost-effective, and second, in their agroclimatic advantage in a few tropical and specialized horticultural products. High productivity resulting from technological progress in developed countries tended to offset the advantage of low labor costs in developing countries.

[6] This was caused by a significant decline in aggregate demand and thus in import demand for potatoes in developed countries, especially in Western Europe, which is the dominant import market for potatoes, 20 times larger than that of the United States. The decline in demand for potatoes also caused production in Western Europe to decline (FAO 1985).

Table 12—Distribution of fruits and vegetables by change in developing countries' share of world trade, 1976-84, and by growth rates of world exports, 1975-85

Share Change, 1975-85	Annual Rate of Growth of World Trade			
	5 Percent or Less	6–9 Percent	10 Percent or More	Total Number of Commodities
	(number of commodities)			
Vegetables				
More than 100 percent	2	2	1	5
11–100 percent	5	6	5	16
0–10 percent	1	3	1	5
Less than 0 (cost share)	0	2	4	6
Total	8	13	11	32
Fruits				
More than 100 percent	2	2	3	7
11–100 percent	5	2	3	10
0–10 percent	3	3	0	6
Less than 0 (cost share)	6	6	5	17
Total	16	13	11	40

Source: Data on horticultural products compiled by the author from various FAO sources.

In many instances, in commodities that experienced a rapid expansion of demand in developed countries with a growing imbalance between domestic supply and demand, technology was transferred to the developing countries to initiate or increase production at competitive costs, frequently with the participation of multinational enterprises or contracts between farmers and importing enterprises. This happened in a few countries in the production and export of pineapples, tomatoes, apples, and grapes, for example, which will be explained further in Chapter 7. Obviously, the trade regime, including the degree of trade restriction in the importing countries, also affected changes in the market shares of developing countries.

Major Exporters of Horticultural Products

A large number of developing countries participate in varying degrees in world horticultural trade. For example, during 1983-85, about 123 developing countries exported horticultural products in varying amounts compared with 31 developed countries. While the number of developing countries exporting horticultural products was four times larger than the number of developed countries, each developing country had a much smaller share of the world market. Four exporting developed countries—but none of the developing countries—had more than a 5 percent share of the world market.

The concentration of exporters was similar in developed and developing countries. Twelve countries accounted for 65 percent of the total horticultural exports of developing countries, and 10 countries accounted for 81 percent of the horticultural exports of developed countries. During 1983-85, 31 countries accounted for 89 percent of the developing countries' total horticultural exports and 70 percent of their total agricultural exports. Over the years the share of these 31 countries in total agricultural exports and in horticultural exports rose, not only in developing-country trade, but also in the world as a whole. At the same time, their share of horticultural exports in total agricultural exports increased (Table 13).

Table 13—Top 31 developing-country horticultural exporters' share of horticultural and agricultural exports, 1961-85

Position	1961-63	1975-77	1983-85
		(percent)	
Share of world horticultural exports	24.47	29.21	32.76
Share of horticultural exports in total agricultural exports	11.77	13.84	16.52
Share of total horticultural exports of all developing countries	73.77	86.80	89.32
Share of agricultural exports of all developing countries	56.04	65.47	70.45

Sources: Food and Agriculture Organization of the United Nations (FAO), "Trade Yearbook Tape, 1985," FAO, Rome, 1986; and data on horticultural products compiled by the author from various FAO sources.

The leading 31 developing-country exporters also accounted for 97 percent of the aggregate increase in exports of all developing countries between 1970-72 and 1982-84. Because the increase in export earnings was predominantly enjoyed by a limited number of exporters, the tendency toward concentration of export markets was accentuated. Although the 31 exporters as a group increased their share of the world market, their individual export performances varied considerably. Did their relative positions in world trade change over time? How did the performance of the principal exporters of today evolve? How many have become exporters only in the past 10 years, and how many have been established exporters for many years?

The composition of the 12 leading exporters changed somewhat from 1961-63 to 1983-85: of the top 12 in 1983-85, 8 were in this group in 1961-63 and 10 in 1975-77. Seven countries—Argentina, Mexico, Morocco, People's Republic of China, the Philippines, Taiwan, and Turkey—retained their positions throughout the entire period. But 3 countries—Ecuador, Honduras, and Singapore—that were among the top 12 in 1961-63 were replaced by Brazil, Costa Rica, and Thailand by 1975-77. Egypt and India, which stayed in the top 12 until 1983-85, were replaced by Chile and Honduras during the final period.

These changes in the top 12 positions illustrate that there was vigorous competition among the developing countries in the export markets. Their relative competitive positions changed over time in response to changes in cost conditions, introduction of new crops, and improvements in transportation and other infrastructure for export marketing. Five countries that were among the top 12 in 1983—Brazil, Chile, People's Republic of China, the Philippines, and Turkey—had consistently rising export market shares. Five countries not included in the top 12 in 1983-85 that consistently increased their market shares between 1961-63 and 1983-85 were Colombia, Guatemala, Hong Kong, Jordan, and Kenya. The shares of the remaining 21 countries fluctuated.

When the period is divided into two decades, in 1965-75, 17 out of 31 countries had growth rates above the developing-country average (10.7 percent); they ranged from 10.7 percent to 45.4 percent (Appendix 1, Table 44). However, 10 of the 17—Afghanistan, Argentina, Costa Rica, Côte d'Ivoire, Cyprus, Egypt, Iran, Republic of Korea, Mexico, and the Philippines—suffered significant declines in the next decade. In 1975-85, 11 out of the 31 countries had annual rates of growth of exports higher than the developing-country average of 8.7 percent, ranging from 9.0 percent to 27.5 percent

per year. Growth rates accelerated for all except Thailand and Turkey during 1975-85. The growth rates of exports of the 12 leading exporters were distributed as follows:

Country	Rate of Growth	Range
Brazil, Chile, Honduras, Thailand, and Turkey	More than 10	10-21
Costa Rica, Mexico, the People's Republic of China, the Philippines, and Taiwan	More than 5	5-9
Argentina and Morocco	More than 1	1-2

The average value of horticultural exports of the 12 countries in 1975-85 was $240 million. Eight countries not in the top 12 had growth rates around 8 percent during this period (Colombia, Cuba, Guatemala, Hong Kong, Kenya, Korea, Liberia, and Singapore), but they were not included in the leading 12 because the average annual value of their exports was only between US$77 million and US$190 million during 1983-85.

Concentration in Horticultural Trade: Sellers and Products

An examination of the markets for individual commodities reveals that four exporters (each exporting 5 percent or more of the total developing-country exports of that commodity) accounted for 80-100 percent of the total exports of developing countries in that commodity in 1983-85. The composition of the four countries varies from commodity to commodity, however. For 23 out of 30 vegetable exports and 27 out of 39 fruits (each worth US$50 million or more), the four top exporters accounted for 80 percent or more of total exports of that product, as indicated in Table 14. The concentration of horticultural exports in the hands of a few exporters was also true for developed countries, as shown in Table 15.

Tables 45 and 46 in Appendix 1 indicate those developing countries that were among the top four exporters for selected fruits and vegetables. For fruits, the dominance of the top four exporters is indicated by the following: Brazil and three other countries accounted for 87 percent of orange juice, shelled cashew nuts, and pineapple juice and 57 percent of miscellaneous fruit juices. Chile and three other countries accounted for 70-90 percent of grapes, apples, pears, miscellaneous nuts, and miscellaneous dried fruits. The Philippines and three others accounted for 80-100 percent of fresh and canned pineapples, desiccated coconuts, and pineapple juice (Appendix 1, Table 45). In vegetables, Taiwan and three other countries accounted for 70-100 percent of the total developing-country exports of the following commodities: prepared vegetables not elsewhere specified (n.e.s.); dehydrated, frozen, and temporarily preserved vegetables; fresh and dried mushrooms; and cabbages. Mexico and three other countries accounted for 80-90 percent of prepared vegetables n.e.s., tomatoes, tomato paste, and chickpeas. Turkey and three others accounted for 90-100 percent of tomatoes, chickpeas, lentils, tomato paste, and broad beans (Appendix 1, Table 46).

Why have a few exporters dominated trade, and what are the implications? One reason, of course, is agroecological characteristics; many horticultural products are

Table 14—Shares of four leading fruit and vegetable exporters in total developing-country exports, 1983-85

Horticultural Products	Number of Commodities in Group	Share
		(percent)
Fruits		
Apple juice (single strength), cherries, orange juice concentrate, dried prunes and plums, hazelnuts, prepared nuts, walnuts, shelled almonds, shelled cashew nuts, and desiccated coconuts	10	100
Peaches, nectarines, strawberries, avocados, shelled hazelnuts, and cashew nuts	6	95–99
Raisins and orange juice (single strength)	2	90–94
Grapes, pears, grapefruit, watermelons, plums, pineapple juice (single strength), apples, canned pineapples, and nuts n.e.s.	9	80–89
Tropical fresh fruit n.e.s., tangerines, cantaloupes, melons, and dried fruit n.e.s.	5	70–79
Bananas, oranges, lemons and limes, fresh fruit n.e.s., and dates	5	60–69
Fruit juice n.e.s, and fruit preparations n.e.s.	2	40–59
Vegetables		
Lentils, canned mushrooms, dried mushrooms, mushrooms, broad beans, asparagus, cabbages, cauliflower, lettuce, and canned vegetables n.e.s.	10	100
Chickpeas, flour of potatoes, cucumbers, tomato paste, and frozen vegetables	5	95–99
Carrots, vegetables temporarily preserved, tomatoes, dried peas, preserved olives, chilies, and peppers	6	90–94
Vegetables preserved by vinegar, prepared vegetables n.e.s.	2	80–89
Garlic, dehydrated vegetables, pulses, and dried beans	4	70–79
Potatoes and dried onions	2	60–69
Fresh vegetables n.e.s.	1	45–59

Source: Data on horticultural products compiled by the author from various FAO sources.
Notes: n.e.s. is "not elsewhere specified."

highly specific to certain soil and climatic characteristics. Only a few developing countries have a wide enough diversity of soil and climatic characteristics to produce a large variety of horticultural products. Second, horticultural exports require a high level of infrastructure in terms of marketing, storage, packaging, and shipping facilities. Therefore, the initial costs of entering export production are high, and the learning period is long. Also, horticultural products vary widely in taste, color, appearance, and quality; they are highly differentiated products. New grades and varieties cannot be easily established: it takes time for consumers to become accustomed to new products. Third,

Table 15—Shares of four leading fruit and vegetable exporters in total developed-country exports, 1983-85

Horticultural Products	Number of Commodities in Group	Share
		(percent)
Fruits		
Grapefruit juice (single strength) and tropical fruit	2	100
Grapefruit juice concentrate, dried plums, hazelnuts, chestnuts, almonds (shelled), and preserved olives	6	95–99
Bananas, tangerines and mandarins, grapefruit, peaches and nectarines, raisins, avocados, walnuts, pistachios, shelled hazelnuts, prepared nuts, and desiccated coconuts	11	90–94
Lemons and limes, cherries, strawberries, watermelons, cantaloupes, pineapples, canned pineapple, pineapple juice, and dates	9	80–89
Oranges, orange juice (single strength), apple juice (single strength), apple juice concentrate, grapes, and dried fruit n.e.s.	6	70–79
Pears, plums, and fresh fruit n.e.s.	3	60–69
Apples and fruit juice n.e.s.	2	50–59
Vegetables		
Chickpeas	1	100
Frozen potatoes and dried mushrooms	2	95–99
Asparagus, peeled tomatoes, cauliflower, pumpkins, canned mushrooms, and canned vegetables n.e.s.	6	90–94
Flour of potatoes, dried beans, lentils, tomatoes, tomato paste, cucumber, chilies and peppers, and garlic	8	80–89
Pulses, lettuce, dried onions, carrots, and mushrooms	5	70–79
Potatoes, dried beans, fresh vegetables n.e.s., dehydrated vegetables, and vegetables temporarily preserved	5	60–69
Prepared vegetables n.e.s. and frozen vegetables	2	50–59

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: n.e.s. is "not elsewhere specified."

new entrants into the market have to adjust their product characteristics and qualities to meet the sanitary and health regulations of the importing countries; the established exporters have a built-in advantage. Finally, exporters usually specialize in different markets, adjusting their products to the preferences of consumers in one or two markets. To overcome consumers' preferences for the products of established exporters in selected markets takes both time and promotional effort. Specialization by exporters in markets is often governed by transportation costs and hence by geography. Also, the market for each individual horticultural product is rather small. The size of the

export market relative to the output in many cases is not large enough to allow many exporters to succeed. An increase in the number of exporters is likely to result in a decline in price, which could force out all but the most efficient or low-cost producers. This is why the share of the market in a particular commodity that is held by the four largest exporters is related to the size of the overall market. The larger the export market, the lower the degree of concentration and the smaller the share of the market held by the four leading exporters.

Major Markets for Horticultural Exports

Where are the major markets for horticultural exports? The developed countries, including centrally planned economies, accounted for 83 percent of world imports during 1983-85; the developing countries accounted for 17 percent.

The rate of growth of imports of horticultural products in the second decade (1975-85) exceeded that of total agricultural imports, starting from almost equal or lower rates of growth during the first decade (1965-75). This was true for both developed and developing countries. In addition, the annual rates of growth of horticultural imports during both periods were higher for developing countries than for developed countries, even though the developed countries continued to import much more.

Period	Developed-Country Imports		Developing-Country Imports	
	Total Agriculture	Horticulture	Total Agriculture	Horticulture
	(percent)			
1965-75	11.30	11.01	13.40	12.60
1975-85	4.75	6.30	8.67	9.30

This is reflected in the rising share of developing countries in world horticultural imports, which rose from 12 percent in 1961-63 to 14 percent in 1975-77 and to 17 percent in 1983-85. The fastest growing regional markets in the developing world were in Far East and Near East, while Latin America's share declined. In the developed world, the markets of North America and Japan grew; both had rising shares of the world's imports, but they were more than offset by the declining shares of other developed regions, especially of Western Europe. Western Europe remained the biggest market in the world for horticultural products, accounting for 50 percent of world horticultural imports during 1983-85, even though its relative share declined over time.[7] Western Europe imported three times as much as North America during 1983-85. North America's share of world imports increased from 12 percent to 18 percent between 1975-77 and 1983-85. The annual rates of growth of horticultural imports of principal developed markets are as follows:

[7] Trade between countries in Western Europe are included in Western European imports, and trade between the United States and Canada is included in North American imports. If intraregional trade were excluded, the relative size of the import market of Western Europe would be less than what is indicated. Western European imports, including intraregional imports, were almost 300 percent higher than those of the United States, but if intraregional imports were excluded, they would be 80 percent higher than the imports of the United States.

Period	United States	Western Europe	Japan
		(percent)	
1965-75	8.38	11.00	18.25
1975-85	15.03	4.82	10.63

Japan had the highest growth rate of imports in 1965-75, but it slowed considerably during the next decade, along with that of Western Europe, whereas the U.S. growth rate increased during the second decade.

What were the major sources of imports of the developed market economies? In general, intraregional trade was more important than extraregional trade. The largest single source of imports of each region was the region itself or a neighboring region. This was less true for developing countries than for developed countries, partly because major sources of imports, as well as exports, were in the developed countries. During the early 1980s developed countries obtained 72 percent of their imports from other developed countries: Western Europe provided 55 percent and North America 12 percent (Figure 1). The developing countries provided 28 percent of imports, with Latin America accounting for 13 percent.

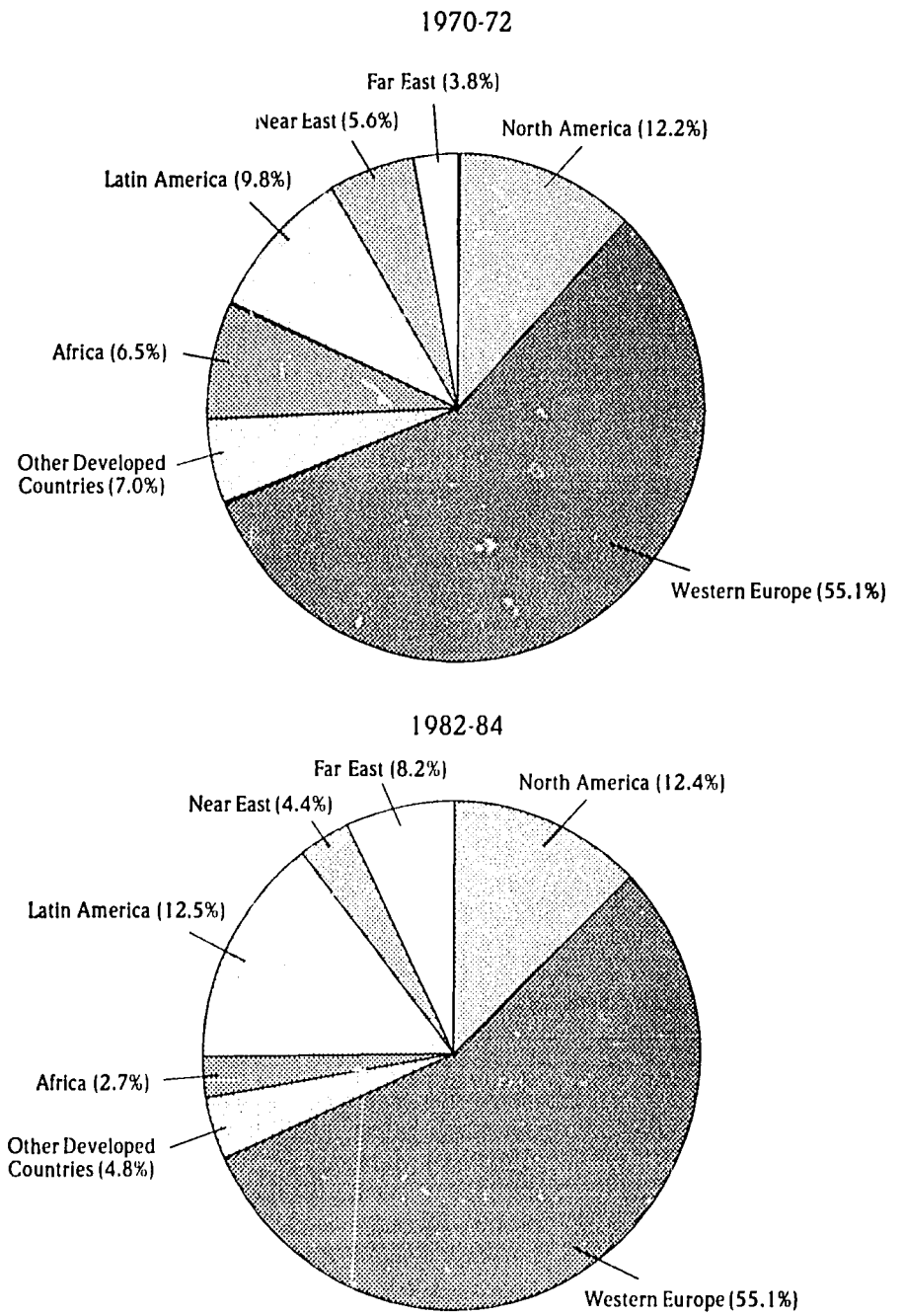
The most important sources of imports of each region during the early 1980s were as follows: Western Europe, 70 percent from Western Europe; North America, 42 percent from Latin America and 29 percent from North America; Eastern Europe, 49 percent from Western Europe and 32 percent from the Near East; Latin America, 59 percent from Latin America and 35 percent from North America; Near East, 42 percent from the Near East and 29 percent from Western Europe; Africa, 60 percent from Western Europe, 11 percent from Africa, and 11 percent from the Near East; Far East, 30 percent from North America and 24 percent from the Far East.

Between the early 1970s and early 1980s, the share of developing countries in the imports of developed countries increased from 26 to 28 percent, a relatively modest increase. Nevertheless the developing countries depended heavily on the developed countries as a market for their exports: 79 percent of developing-country exports went to developed countries during 1982-84, declining from 84 percent in 1970-72 (Figure 2). Even though intradeveloping-country trade increased from 16 percent in 1970-72 to 21 percent in 1982-84, the developed countries still dominated the market. Also, developed countries remained a major source of imports of developing countries—49 percent during 1982-84 compared with 45 percent during 1970-72.[8] The dependence of the developing countries on the developed countries as a market for their exports was much greater than their dependence on them as a source of imports.

Since most exports from both developed and developing countries were destined for the developed countries, the neighboring developed region was the largest export market for all regions except the Far East; its exports were more widely distributed. The most important export markets for each region were as follows: Western Europe, 87 percent to Western Europe, 3 percent to Eastern Europe, and 2 percent to the Near East; North America, 34 percent to North America, 27 percent to Western Europe, and 7 percent to the Far East; Africa, 78 percent to Western Europe and 7 percent to

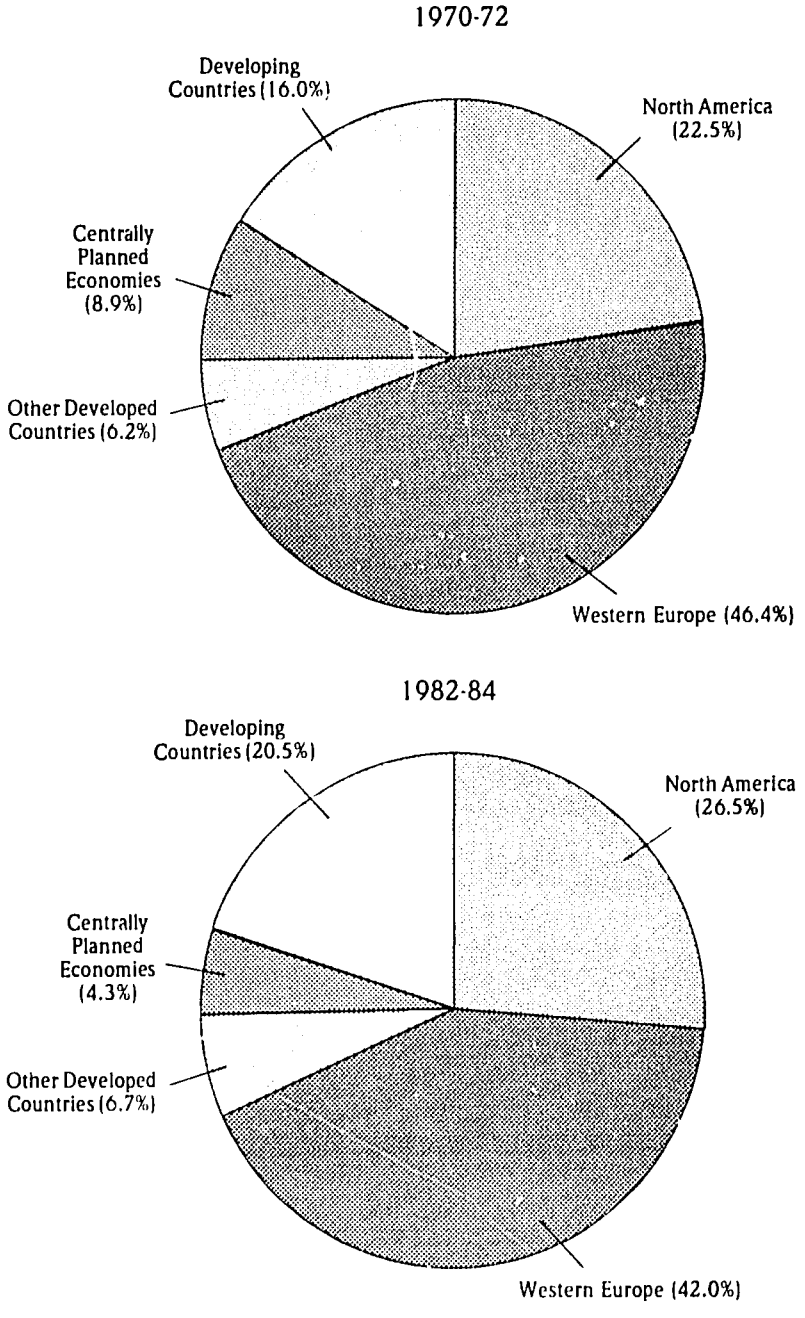
[8] The source of data for the direction of trade flows is the United Nations' trade matrix data tape (United Nations, various issues).

Figure 1—Regional shares of developed-country imports, 1970-72 and 1982-84



Source: United Nations, "Trade Data Tape," New York, 1987.

Figure 2—Destinations of exports of developing countries, 1970-72 and 1982-84



Source: United Nations, "Trade Data Tape," New York, 1987.

Africa; Latin America, 51 percent to North America and 12 percent to Latin America; Near East, 40 percent to Western Europe and 26 percent to the Near East; Far East, 58 percent to Western Europe, 18 percent to other developed countries, and 9 percent to the Far East.

Geographical proximity plays an important role in trade of horticultural products, first, because many fruits and vegetables are highly perishable, and the costs of packaging and processing them for long-distance transport are high. Second, tastes for horticultural products tend to be similar in neighboring regions, partly because products grown under the same conditions are likely to be familiar. Finally, trade tends to flow between countries and regions that have long-established economic relationships. For example, in Western Europe, trade preferences are given to European Community countries, but also to African, Caribbean, and Pacific (ACP) countries that have historical ties (Alvensleben 1982). In any attempt to promote horticultural exports in the future, the special role of regional markets needs to be recognized.

That export markets tend to be concentrated by region is true not only when the exports of different regions are considered as a whole but also for individual exporting countries. The following table shows the market specialization of principal exporters in 1982-84.

Percentage of Exports Destined for One Region	Number of Countries
70 or more	10
50–70	7
25–50	5

Constant Market Share Analysis of Exports of Different Developing Regions

The export performance of developing countries and of each region can be decomposed, on the basis of market share analysis, into three different components: *the import growth effect,* which represents the extent of increase in exports due to the overall growth of imports in all importing regions, under the assumption that the exporting region's share in all markets remains unchanged; *the market effect,* which represents a change in exports due to uneven growth of demand in importing regions (a positive market effect indicates a concentration of the region's exports in relatively fast-growing import markets); and *the competitive effect,* which represents a change in the region's competitiveness and hence in its share of world markets. The model of the constant market share analysis is described in Appendix 2.

Africa

Among developing regions only Africa experienced a large decline in exports. Between 1970-72 and 1983-85 the real value of horticultural exports fell approximately 3 percent per year, mainly due to a decline in exports from Morocco and Algeria. Morocco, the largest horticultural exporter, accounted for 46 percent of the total exports of this region in 1983-85. However, some African countries—Kenya, for example—increased the real value of their exports.

The import growth effect for Africa was positive. That is, the actual increase in exports would have been positive if it had maintained its 1970-72 overall market share. The market effect, however, was negative, which indicates that Africa's exports were directed to the slower-growing import markets. The largest proportion of African exports went to Europe (including Eastern Europe), where import growth was below average, while Africa's market share of the fast-growing markets, such as North America and Japan, was very low—less than 1.0 percent of the North American market and 1.5 percent of the Japanese. The competitive effect was not only negative but so large that it offset the positive import growth effect. The negative competitive effect resulted in a loss in Africa's share of all markets. A recent IFPRI study shows that Africa was not able to improve or even maintain its competitive position in 37 out of 49 agricultural export commodities (Koester, Schafer, and Valdés 1988). The sources of growth in exports vary among different commodities. Africa lost competitive position in all categories of horticultural products except dried fruits. At the same time, the market effect was negative or zero in all cases except fresh fruits. The overall growth effect, in relation to the other two components, was most important for fresh fruits and processed vegetables and accounted for an increase in exports of those products.

Latin America

The horticultural exports of Latin America increased in real terms by approximately 4.9 percent per year during this period. Brazil, Chile, Colombia, and Cuba achieved the largest increases in exports.

Fifty percent of the increase in Latin American exports can be attributed to import growth. Also, the region sent its exports to markets with relatively fast-growing import demand—North America and Japan. During 1970-72 Latin America's share of North American imports was approximately 34 percent, and 22 percent of Japanese imports. Furthermore, the region gained in overall competitiveness and increased its share in all markets except Japan's.

Latin America suffered a decline in the real value of fresh vegetable exports because it lost market share, a loss that more than offset the positive overall growth effect, and also, though less important, some of the positive market effect. There was an increase in all other categories of exports. Along with positive growth and market effects, Latin America had a competitive advantage in processed fruits and vegetables. For example, 50-60 percent of the increase in these two categories of exports was due to a rise in market share. In the case of fresh and dried fruits, Latin America suffered a negative competitive effect, which was more than offset, however, by the positive overall growth and market effects.

Near East

The Near East increased its export earnings by an amount that accounted for 22 percent of the total increase in exports of all developing countries. Although the market and the competitive effects were both positive, it was the positive import growth effect that explained an overwhelming proportion of the increase in earnings during this period. The region did diversify its export market somewhat, mostly by boosting intra-regional trade. The proportion of intraregional exports increased from 5.7 to 25.6 percent between 1970-72 and 1983-85. The importance of the Eastern European market decreased from 27.3 to 13.7 percent.

All major exporters in the region, except Iran, increased their exports. Turkey, the biggest exporter, was responsible for 63 percent of the region's increase in exports.

In both fresh and dried fruits, the Near East suffered from significant negative

competitive effects that more than offset the positive growth and market effects. A positive competitive effect largely accounted for the increase in exports of processed fruits and vegetables; the next most important factor was the positive import growth effect. In the case of fresh vegetables, positive competitive and market effects were primarily responsible for the increase in exports.

Far East

The export markets of the Far East were more widely diversified than those of the other regions. The region exploited its comparative advantage by expanding its share of the world market. Unlike other developing regions the competitive effect was most significant in the Far East, followed by positive import growth and market effects in that order.

Among Far Eastern countries, all the major exporters achieved significant increases in exports. No country experienced a decline in its export earnings. The region gained competitive advantage in all categories of exports except processed fruits and vegetables. Increases in processed vegetables were due to positive growth and market effects that more than offset the negative competitive effects. A positive competitive effect was the most dominating factor in the export growth of fresh fruits, dried fruits, and fresh vegetables. In the case of fresh and processed fruits, the market effect was quite important. Only in fresh vegetables was the market effect negative and offset by positive competitive and growth effects in that order.

Conclusions

In summary, among the different factors contributing to growth in export earnings in various regions, the overall growth effect was the most important factor in the Near East, accounting for 74 percent of the region's exports, and the competitive effect—change in market share—was the most important factor in the Far East, accounting for 43 percent of the increase in its exports (Table 16). For Latin America, the overall growth effect and the market effect, in that order, were the important factors. In terms of market effect, Latin America gained more than any other region from concentration of its exports in the fast-growing markets. Whereas both Latin America and the Near East increased their market shares, their success in this respect was much less pro-

Table 16—Distribution of total change in exports due to various components of constant market share analysis by region, 1970-72 and 1983-85

Region	Change in Exports	Growth Effect	Market Effect	Competitive Effect
			(percent)	
Africa	-100	175.9	-23.8	-252.2
Latin America	100	50.5	33.5	16.0
Near East	100	74.1	7.8	18.1
Far East	100	37.3	20.1	42.6
All developing countries	100	72.3	23.8	3.9
All developed countries	100	120.4	-15.4	-5.0

Sources: Data on horticultural products compiled by the author from various FAO sources; and United Nations, "Trade Data Tape," New York, 1987.

nounced than that of the Far East. Africa lost heavily in market share because it exported to markets that were growing slowly.

Developing Countries as a Whole

About 72 percent of the increase in the real value of exports of developing countries as a whole was explained by the overall growth in imports. Positive market effects were next in importance, accounting for 24 percent of the total increase in exports. Although there was a gain in market share for developing countries, its importance was relatively small. Only 4 percent of the increase was accounted for by a positive competitive effect. Because the developed countries increased the share of imports in their aggregate consumption of horticultural products, the developing countries were able to reap the benefits of overall growth and also to capture a larger share of this market.

Developed Countries as a Whole

The exports of developed countries suffered from both negative market and competitive effects. They not only lost market share but their exports were not predominantly directed to fast-growing markets. However, overall exports did increase due to the high growth of aggregate world import demand.

Among developed countries, five big exporters—the United States, the Netherlands, Spain, France, and Italy—whose combined market share in the world market was almost 40 percent, accounted for 73 percent of the total increase in exports of developed countries. North America and Western Europe increased their market shares slightly, but other developed regions such as Oceania, Japan, and Eastern Europe lost market shares.

4

DETERMINANTS OF EXPORT PERFORMANCE: A QUANTITATIVE ASSESSMENT

As earlier chapters have shown, developing countries differed widely in their export performance in horticultural products, not only in the volume or value of exports but also in the relative importance of horticultural exports in their total agricultural exports, as well as their relative share in world horticultural exports. Furthermore, both the rate of growth of horticultural exports and market shares changed over time. Obviously, differences in export performance depended on both supply and demand conditions, that is, on factors influencing the production and exportable surplus of horticultural products in the exporting countries, on the one hand, and the circumstances governing demand in the importing countries, on the other.

In this chapter, the factors that may have contributed to the differences in performance of exporting countries are analyzed, and price and income elasticities of demand and supply of exports are estimated. The latter is expected to check the realism and consistency of assumptions made in later chapters, especially those regarding the price elasticities of export supply and demand.

In this context, a few general characteristics of the 31 principal exporting countries that accounted for 90 percent of the horticultural exports of developing countries should be noted. First, the overwhelming majority of the exporting countries belong to the middle-income category.[9] This was so in 1983-85, the last period for which the published export data are analyzed, but it was also true as early as 1975. Four of the 31 countries were in the low-income category, whereas 8 countries were in the upper middle-income category and the rest in the lower middle-income category.

Second, many of the principal horticultural exporting countries also did well in manufactured exports. The export of horticultural products requires a certain level of skill and sophistication in postharvest operations, including grading, packaging, storing, transporting, and shipping abroad. This is because of the perishable nature of products and the risk of deterioration in quality in the course of handling, storing, and transporting if these operations are not done carefully and according to a rigid time schedule. Moreover, their production requires not only careful husbandry but also more sophisticated management than other agricultural products.

The processing of horticultural products requires a degree of organization and management that is often associated with a high level of income and a developed domestic market. The actual techniques of processing of horticultural products may not require a high level of technology, but quality control, compliance with strict health and sanitary standards, and efficient packaging are important for export marketing. The sophistication and organizational requirements for horticultural exports, especially processed exports, resemble those for manufacturing exports.

[9] The income categories are defined in the World Bank's *World Development Reports* (various years).

Factors Contributing to Differential Export Performance

The following factors are important in determining the differences between the export performance of countries with the same general external economic environment. Per capita income, as an explanatory variable (GDP), is a combination of many factors. First, it represents the size and attractiveness of the domestic market because it determines the relative pull of domestic demand. High per capita income implies a larger domestic market and enables the realization of economies of scale in marketing and processing, which provides a cost advantage in the export market. Experience in selling in a large national market facilitates export marketing. Potential exporters "learn by doing" in packaging, processing, and selling in the national market, especially the urban market. Second, a national market provides a cushion to absorb the shocks from fluctuations in demand in the export market. Per capita income is also partly a surrogate variable for the availability of infrastructure such as transportation, communication, and credit for both production and export.

Social and physical infrastructure variables, such as the level of education in the country (literacy or enrollment in primary and secondary schools, for example), the number of vehicles per square kilometer, the number of tons carried by rail per square kilometer, and the number of tons loaded onto ships in the harbors, are considered relevant in explaining horticultural exports. However, the data on these variables necessary to undertake a systematic analysis is often either not available or of very poor quality. Proxies are used to represent some of these variables. For instance, availability of shipping facilities as indicated by the tonnage loaded in the ports of respective exporting countries (LOAD) is a proxy for physical infrastructure, and secondary school enrollment (EDU) is a proxy for skilled labor or human infrastructure. These proxies are not very satisfactory. Therefore, in many cases, per capita income (GDP) is assumed to represent the level of human infrastructure, including training and education and physical transport and communication facilities, both internal and external.

The real exchange rate variable (RER)[10] represents the effect of macroeconomic policy on the international competitiveness of the exporting countries. This variable is constructed so that an increase in the real exchange rate indexes indicates an appreciation. Therefore, a rise in the real exchange rate should lead to a decrease in exports and vice versa.

The supply of exports is naturally expected to depend on domestic production (PROD). Unless horticultural products are exclusively produced for and sold in domestic markets, a high level of production will result in an increase in export supply.

As indicated before, the processing of horticultural products often requires the same level of organizational and management skills associated with manufacturing exports. Therefore, countries that do well in manufacturing exports are expected to have a competitive advantage in horticultural exports. Hence, the share of manufactured exports in total exports (SMAN) is designated an explanatory variable.

An attempt is also made to identify a variable to indicate the relative openness or outward orientation of an economy. It is assumed that a relatively open economy is likely to have a higher ratio of trade to GNP than others. However, the size of the economy is important; a large economy is likely to have a lower trade-GNP ratio than

[10] To calculate the real exchange rate, the nominal exchange rate of each country is adjusted by the differences between its own inflation rate and the weighted average inflation rate of the industrial countries, measuring inflation by the rate of increase of the implicit GNP deflator.

a smaller economy, given the same degree of discrimination against the tradable sector. In the sample of countries considered in the econometric analysis, variations in sizes of economies are not significant. An index of trade dependence (TDEP)—the ratio of exports and imports (total trade) to GNP—is used as an index of openness of the economy. Basic data sources for each of these variables are provided in Appendix 2.

Tables 17 and 18 indicate the degree of general association between export performance and a few of the foregoing factors. In Table 17, for example, countries are grouped according to their exports per capita. The corresponding values of other variables for each group show that a higher level of exports per capita is associated with higher domestic production per capita, income per capita, relative openness of the economy, and shipping facilities. However, there is no clear association between the value of exports per capita and either the educational level or the share of manufactured commodities in total exports. In Table 18 the rates of growth of the various factors all seem to be related to the rate of growth of exports; that is, a higher growth rate of exports is associated with higher rates of growth in other variables. The criteria for grouping the countries are the value of exports per capita during 1982-84 in Table 17 and the rate of growth of export values during 1975-84 in Table 18.

An attempt is made to quantify the relative importance of the factors that explain the differences in performance of various countries. The export performance equation below is not a reduced-form equation derived from a full structural model, and therefore, it is not related to the structural equations in the next section.

The modest aim of this equation is to explore whether there is any association between the horticultural exports of various countries and characteristics of their economies that seem relevant in light of the analysis in previous chapters and earlier studies on the subject. Hence, a simple regression model is attempted.[11] In this exercise no attempt is made to interpret the estimated coefficients as estimates of elasticities of export volumes with respect to various explanatory variables. In fact, the focus of attention is *not* on the *magnitude* of these coefficients but on their significance. In

Table 17—Absolute level of each variable, by country group, 1982-84

Variable	Group 1	Group 2
Exports per capita (US$)	31.67	6.49
Production per capita (kilograms)	0.32	0.17
GDP per capita (1980 US$)	1,848	1,199
TDEP	0.75	0.33
LOAD per capita (kilograms)	1.07	0.41
EDU	0.47	0.46
SMAN	0.23	0.35

Sources: See Appendix 1 for sources of basic data for each variable.
Note: Group 1 represents countries with per capita exports above the sample average, and Group 2 is countries below the average. TDEP is the variable for trade dependence, LOAD is tonnage loaded in exporting countries, EDU is secondary school enrollment, and SMAN is the share of manufactured exports in total exports.

[11] Such a model is neither an export demand nor an export supply function, nor is it derived from a comprehensive structural model of the sector. Such models, called export performance or export determination models, abound in the conventional international trade literature. See Diakosavvas and Kirkpatrick (1989) for references.

Table 18—Average annual growth rates, by country group, 1975-84

Variable	Group 1	Group 2
	(percent)	
Export	15.21	4.14
PROD	2.80	2.07
GDP	2.51	1.59
TDEP	0.55	-0.13
LOAD	6.12	2.09
EDU	0.91	0.76
SMAN	2.67	0.65

Sources: See Appendix 2 for sources of basic data for each variable.
Notes: Group 1 represents countries with growth rates of exports above the sample average, and Group 2 is countries below the average. PROD is domestic production, GDP is income per capita, TDEP is trade dependence, LOAD is tonnage loaded in exporting countries, EDU is secondary school enrollment, and SMAN is share of manufactured exports in total exports.

other words, the idea is to explore whether there is a significant association between these variables and exports.

Since the rationale for including explanatory variables in the equation is based on general considerations, the specification of the equation may not be complete, and exclusion of some important variables may bias the estimated coefficients. One hopes that the results of this exercise can be used as a starting point in selecting a set of exogenous variables to be included in a more general structural model.

With that end in view, an econometric exercise is carried out by pooling the cross-section and time series data for 25 countries over the period 1975-84. The variables are expressed as logarithms of index numbers. The regressions explaining export performance are estimated using the dummy variable model.[12] The form of the estimated equation is as follows and the results are given in Table 19.

$$\ln X_{ti} = a_i + b\ln(RER)_{ti} + c\ln(GDP)_{ti} + d\ln(PROD)_{ti} + e\ln(TEP)_{ti} + f\ln(LOAD)_{ti} + g\ln(EDU)_{ti} + h\ln(SMAN)_{ti} + u_{ti}; \quad (1)$$

$t = 1975, \ldots 1984; \quad i = 1, \ldots 25.$

In the first regression in Table 19 two sets of variables are used to explain export performance—two domestic factors, GDP and PROD, and two external factors, RER and TDEP. As expected, the estimated elasticity of domestic production is significant.[13]

[12] In this model an intercept dummy corresponds to each country. The dummy variable that corresponds to country i takes the value one for observations for country i but zero for observations on the other countries.

[13] The question may be raised of whether domestic production of horticultural commodities can be treated as exogenous. Since exports of horticultural products constitute less than 3-4 percent of total horticultural products, the possibility of any simultaneity problem between exports and domestic production is minimal. Even the export market for products such as bananas, if taken for developing countries as a whole, constitutes a relatively small percentage of their total domestic production.

Table 19—Estimates of export performance, 1975-84

Regression Number	Elasticity of Quantity with Respect to							
	RER	GDP	PROD	TDEP	LOAD	EDU	SMAN	$\bar{R}^2$
1	0.072 (0.571)	0.492* (3.002)	0.966* (7.298)	0.065 (0.726)	...	...	...	0.34
2	...	...	0.902* (6.867)	0.074 (0.101)	0.206* (4.386)	0.162* (2.000)	...	0.38
3	...	...	...	0.031 (0.372)	0.256* (4.954)	0.351* (4.205)	0.108* (1.950)	0.24
4	...	0.521* (3.449)	0.914* (6.950)	...	...	...	0.110* (2.186)	0.36
5	...	0.575* (3.494)	...	...	0.209* (4.037)	0.248* (2.878)	0.116* (2.169)	0.36

Sources: See Appendix 2 for sources of basic data for each variable.
Notes: PROD is domestic production, GDP is income per capita, TDEP is trade dependence, LOAD is tonnage loaded in exporting countries, EDU is secondary school enrollment, and SMAN is share of manufactured exports in total exports.
* = Significant at the 95 percent level.

GDP used as a surrogate variable also turns out to be very significant. GDP includes, among other factors, the effect of export-related infrastructure of the economy. However, neither RER nor TDEP appear to have any significant explanatory power.

In the second regression, GDP is replaced and two variables relating to infrastructure, LOAD and EDU, are introduced. Both of these variables prove to be significant in explaining differences in export performance. Because GDP is also a surrogate for a multiplicity of factors, including the size of the domestic market, its implications for export, and the availability of infrastructure, it is combined in estimation with other variables such as PROD, LOAD, EDU, and SMAN. In all regressions containing GDP, the estimated elasticity of GDP is large and significant. SMAN turns out to have a significantly positive effect on exports.

Primary education and the degree of concentration in the composition of exports are also tried as explanatory variables, but they are not significant. Similarly, the commodity composition of exports—the proportion of fruits and vegetables in total horticultural exports—has no significant effect on export performance.

To the extent that horticultural products are labor intensive, countries with abundant labor in relation to land and with relatively low wages are likely to perform better in horticultural exports than those with scarce labor supply and relatively high wages. Data on relative wages in different countries are difficult to come by. The proportion of agricultural population per hectare of arable land may be considered a surrogate for the pressure of population on land. But a preliminary analysis does not indicate that this variable is related to horticultural exports, either in terms of the absolute or per capita quantity of exports or the market share, that is, the share of individual countries in world trade of horticultural products or the share of horticultural exports in total agricultural exports.

The finding that infrastructure, size of the domestic market, and shipping facilities are important factors influencing export performance seems to be consistent with expectations. The relevance of per capita income as a surrogate variable does not imply that low-income countries would not be able to make headway in the promotion of

horticultural exports; it merely indicates the importance of the various factors that are represented by it. As a country develops its export-related infrastructure and as the domestic market expands, its export possibilities are more likely to be realized. These factors reflect or affect the general state of economic development, so that the capacity to export and compete in the world market grows at about the same pace as the increase in income.

This analysis confirms the importance of macroeconomic policies relating to public investment in infrastructure; public policies that encourage private investment also have an important role to play. Macroeconomic policies that relate to the export orientation of an economy and to exchange rate policy are not found to be significant factors. That exchange rate policy is not found to be significant does not necessarily imply that price elasticities of demand and supply of exports are not significant, however. This leads to the investigation in the next section, which explores the relationship of export prices to world prices, and whether domestic prices of exporting countries are important in explaining their export performance.

Export Demand and Supply Elasticities

In this section, export demand and supply equations are estimated for the horticultural exports of all the developing countries taken together, on the basis of historical time series data (see Appendix 2 for a more detailed description). The price and income elasticities obtained from this exercise indicate whether horticultural products enjoy a competitive advantage in terms of higher price and income elasticities (market opportunities), and they can also be used for projections and simulations.

This exercise is based on an imperfect substitution model, that is, neither imports nor exports are perfect substitutes for domestic goods. The justification for such a model has been argued extensively in the literature on the estimation of income and price elasticities relating to supply and demand of internationally traded commodities in the aggregate and for individual groups of agricultural commodities.[14]

Export demand is considered to be a function of the export prices of exporting countries, the prices of competing exporters, and the incomes of the importing countries. The demand equation is specified as follows:[15]

$$\ln X_t^d = a_0 + a_1 \ln(PX_t/PW_t) + a_2 \ln(YW_t), \qquad (2)$$

where

X^d = the quantity of exports from developing countries,
PX = the export price of developing countries in dollars,
PW = the average export price in international markets, and
YW = the real income in importing countries.

[14] Although a full structural general equilibrium model incorporating both the domestic and external markets for horticultural commodities might have been an ideal framework of analysis, such an exercise would require data of a kind not currently available, and not strictly needed to obtain a general idea of the sizes of elasticities involved in testing the realism and consistency of the elasticity coefficients used in subsequent simulation exercises. The imperfect substitution model used in a large number of studies to estimate price and income elasticities in international trade for disaggregated agricultural commodity groups, including foods, beverages, and raw materials, and for individual commodities is illustrated in Goldstein and Kahn 1985, Bond 1987, and Stern, Francis, and Schumacher 1976.

[15] A similar set of demand and supply equations is used by Goldstein and Khan (1978) and Bond (1987) in obtaining export supply and demand elasticities.

Export supply in the exporting country is affected by current and lagged export prices, the domestic price level in producing countries, domestic production capacity, and supply shocks. The supply equation is specified as follows:

$$\ln X_t^s = b_0 + b_1 \ln(PX\,ER/P)_t + b_2 \ln(PX\,ER/P)_{t-1} + b_3 \ln(Y)_t + b_4(SS)_t, \quad (3)$$

where

X^s = the quantity of exports from developing countries,

ER = the exchange rate of developing countries, in local currency per U.S. dollar,

P = the domestic price level in developing countries in local currency,[16]

Y = overall production capacity in developing countries, and

SS = supply shocks.

The domestic price relative to the export price is used to indicate the attractiveness of domestic versus foreign markets, and t−1 indicates the lag in the response of exports to price changes. The domestic production capacity variable is used as an explanatory variable since exporters' ability and willingness to supply exports are dependent on the production capacity of the economy as a whole. In other words, exports are expected to rise when there is an increase in the country's capacity to produce. Real income (GDP) is used as a surrogate variable of domestic production capacity. Apart from this, as mentioned earlier, GDP serves, first, as a surrogate variable for human and physical infrastructure, including training and education and transportation and communications and, second, as a variable for the size of the domestic market, which provides economies of scale in production and hence cost advantages in exports. The supply shocks are introduced to represent the two oil crises, one in 1974/75 and another in 1979/80, which dislocated the flow of world trade; hence dummy variables are used to indicate their effects.

The supply equation can be normalized for the price of exports as follows:

$$\ln(PX)_t = \beta_0 + \beta_1 \ln(X^s)_t + \beta_2 \ln(ER/P)_t + \beta_3 \ln(PX\,ER/P)_{t-1} + \beta_4 \ln(Y)_t + \beta_5 SS_t. \quad (4)$$

The coefficients of the normalized equation are related to the structural parameters in the following way:

$$\beta_0 = -b_0/b_1,\ \beta_1 = 1/b_1,\ \beta_2 = -b_1/b_1,\ \beta_3 = -b_2/b_1,\ \text{and}\ \beta_4 = -b_3/b_1,\ \beta_5 = -b_4/b_1. \quad (5)$$

[16] In constructing the series ER/P for the developing world as a whole, data from 31 countries, explaining 90 percent of total developing-country exports, were used: $ER/P = \Sigma \alpha_i ER_i/P_i$, $\Sigma \alpha_i = 1$, where α_i is the weight of each country's GDP in the aggregate GDP of the top 25 developing exporters. This is the weighted sum of real exchange rates of each country; weights being the ratio of each country's GDP to the combined GDP of 25 countries. (Data from 25 countries instead of 31 are used because of data availability.)

In equilibrium, the following relationship holds, $\ln(X_t) = \ln(X^d)_t = \ln(X^s)_t$.

In this simultaneous equation model of export demand and supply, there are two endogenous variables, $\ln(X)_t$ and $\ln(PX)_t$, and six exogenous variables, including a predetermined (lagged) variable. They are $\ln(YW)_t$, $\ln(PW)_t$, $\ln(ER/P)_t$, $\ln(Y)_t$, $(SS)_t$, and $\ln(PX\ ER/P)_{t-1}$.[17]

Equations (2) and (4) are estimated simultaneously using a two-stage least squares (2SLS) technique for the period 1965-85. The estimated price and income elasticities of export demand and supply are reported in Table 20 for groups of fruits and vegetables.

The results show that the model used performs reasonably well in providing elasticity estimates that are statistically significant and of the expected sign. Estimates of price elasticities obtained in this section are, in general, comparable with the assumed price elasticities ranging between 0.5 and 1.0 that are used in the simulation of trade liberalization in Chapter 5.

The estimated price elasticities in the export demand equation are both negative and significantly different from zero at the 90 percent level in 13 of the 22 equations estimated. The following conclusions can be drawn from the estimation results of the demand equations.

1. The response of demand for exports to changes in relative prices differs widely among commodity groups. Total vegetables are higher than total fruits, and the elasticity tends to be higher for processed products than for fresh products for both fruits and vegetables. In every case, however, the estimated price elasticities in Table 20 are larger than those of other agricultural commodities obtained from past studies. The higher, though often inelastic, elasticities of horticultural products, ranging from −0.33 for fresh roots and tubers to −5.35 for nontropical juices, suggest that export earnings could be higher for horticultural products than for other agricultural commodities. Higher elasticities result from an increase in demand associated with a decline in price either when trade is liberalized in developed countries or when cost-reducing technological progress is made in developing countries. Past studies have indicated a range of average price elasticities for the groups of agricultural commodities between −0.42 for food products and −0.45 for beverages and tobacco.[18] Recent studies by Bond (1987) and Goldstein and Kahn (1985) also confirm relatively low price elasticities of export demand for agricultural commodities. Bond's range between −0.22 for food and −0.62 for agricultural raw materials, and Goldstein and Kahn's, between −0.58 for food and −0.67 for agricultural raw materials.

2. Most of the estimated income elasticities have the right sign and are significantly different from zero. The aggregate income elasticity is 1.16 for vegetables and 0.95 for fruits—considerably larger than for other agricultural commodities where the estimates usually fall in the range of 0.35 for beverages and tobacco to 0.80 for agricultural raw materials.[19] At more than 1.70 for both fruits and vegetables, the results demonstrate the elastic nature of export demand in response to income changes in processed horticultural products. Income elasticity is more than twice as large in processed

[17] However, both equation (2) and equation (3) have homogeneous linear restrictions on the coefficients of some variables, for instance, between $\ln(PX)_t$ and $\ln(PW)_t$ in equation (2) and between $\ln(PX)_t$ and $\ln(ER/P)_t$ in equation (3).

[18] Studies by Behrman (1977) and UNCTAD (1974) calculated median demand elasticities from estimates gathered from about 200 studies, and Askari and Cummings' (1977) survey is a useful source for the supply elasticities.

[19] These figures are obtained as averages of individual commodities for the groups of commodities in Behrman (1977), UNCTAD (1974), and Askari and Cummings (1977).

Table 20—Demand and supply elasticities for fruit and vegetable exports using two-stage least squares, 1965-85

Commodity Group	Demand			Supply	
	Price	Income	$\bar{R}^2$	Price	$\bar{R}^2$
Fruits					
Fresh	-0.71*	0.74*	0.96	1.08*	0.98
Bananas	-1.60	0.67*	0.84	0.53*	0.99
Oranges	-0.60**	0.96*	0.96	1.42*	0.97
Tropical	-1.04**	0.38*	0.84	0.48*	0.96
Nontropical	-0.85	1.32*	0.93	0.56*	0.97
Treenuts	-0.78	0.17	0.06	0.18	0.92
Processed	-0.98	1.78*	0.98	1.29*	0.96
Nontropical juices	-5.35*	6.97*	0.96	3.58*	0.97
Tropical juices	-2.24*	2.09*	0.94	0.35*	0.95
Other nontropical fruits	-1.38*	1.73*	0.97	1.12	0.95
Other tropical fruits	-1.50	1.39*	0.10	0.64*	0.97
Treenuts	-0.54	0.71*	0.66	0.69	0.95
Total	0.51*	0.95*	0.98	0.94*	0.99
Vegetables					
Fresh	-0.57*	0.84*	0.91	1.29*	0.91
Roots and tubers	-0.50*	0.93*	0.78	0.30*	0.95
Hops	-2.72*	5.89*	0.29	1.86*	0.29
Miscellaneous vegetables	-0.52*	0.89*	0.92	1.20*	0.93
Processed	-1.41*	2.04*	0.93	0.62*	0.92
Roots and tubers	-1.00	-2.09*	0.34	...	...
Pulses	-0.33	0.75*	0.60	0.40*	0.77
Miscellaneous vegetables	-1.29	3.34*	0.98	1.53*	0.98
Total	-0.82*	1.16*	0.93	0.87*	0.94

* significant at the 95 percent level.
** significant at the 90 percent level.

products as in fresh products. Between the different groups of fruits and vegetables, processed nontropical juices (6.97) in fruits and processed miscellaneous vegetables (3.34) in vegetables are the highest.

The estimated price elasticities in the export supply equation are significantly positive in most equations, which suggests that export supply for horticultural products in developing countries responds to price incentives. The estimated export price elasticity of supply is 0.94 for fruits and 0.87 for vegetables. The estimate is less plausible for processed vegetables (0.62), since it is much smaller than that of fresh vegetables (1.29), which is highly unlikely. However, the size of the price elasticity for miscellaneous processed vegetables alone, which composes more than half of the processed vegetables category, is larger than that of fresh vegetables. In fruits, the estimate is higher for the processed products and tends to be higher for temperate-zone processed fruits than for tropical processed fruits. The supply elasticity of oranges (1.42) is highest among the fresh fruits, whereas elasticities of bananas (0.53) and tropical fruits (0.48) are low.

It is widely accepted that the equation for specification of supply presents a difficulty: the performance of the equation is often too poor to generate reliable estimates of supply elasticities. Therefore, findings of different studies are more difficult to compare for supply equations than for demand equations.

The estimates of supply elasticities obtained here for fruits and vegetables are higher than those found for traditional agricultural commodities in past studies. For example, the supply elasticity obtained by Bond (1987) fell in the range of 0.43 for agricultural

raw materials to 0.70 for food, which is still higher than the results in other studies. The evidence that horticultural products are more price responsive than other agricultural commodities is very encouraging for those developing countries that have an interest in the potential for horticultural exports to increase their overall agricultural exports. Therefore, more detailed information about price and income elasticities for individual commodities, relevant to individual countries, is needed to analyze the effect of changes in domestic prices, foreign prices, and foreign income on a country's exports.

5

TRADE BARRIERS AGAINST HORTICULTURAL EXPORTS AND THE EFFECTS OF POSSIBLE LIBERALIZATION

Horticultural exports of developing countries are constrained by tariff and nontariff barriers in importing countries. Since developing countries send an overwhelming proportion of their horticultural exports to developed countries, the trade restrictions imposed are of crucial importance to the expansion of developing-country exports. In general, tariffs on horticultural products vary by product, season, and country of origin. But tariffs may also depend on more specific differences, such as the packaging unit, the content of sugar or other ingredients, or the stage of processing. In the case of nonstorable horticultural crops such as fresh vegetables and fruits, seasonal tariff rates are often applied. In other words, higher tariffs are placed on imports during the seasons when they compete with domestic products. A wide range of nontariff barriers also affect trade in horticultural products. They include quotas, voluntary export constraints, variable levies, minimum price systems, countervailing taxes and duties, technical specifications (especially health restrictions and strict labeling and packaging specifications), and even bureaucratic delays and uncertainties.

Tariffs

Table 21 briefly summarizes effective tariff rates in selected developed countries that prevailed during the period of the post-Tokyo Round. This table provides separate tariff rates for vegetables and fruits and for fresh and processed items within each category. Of the three major importers in the developed world, the European Community, Japan, and the United States, Japan had the highest effective tariff rates in all categories. The European Community had the second highest rates on fresh fruits and processed vegetables, whereas the United States was second for fresh vegetables and processed fruits. The effective tariff rates on processed fruits were almost the same in Japan and the United States.

Furthermore, the effective tariff rates on processed fruits and vegetables were higher than those on fresh vegetables and fruits, sometimes significantly higher. For example, in the United States, processed fruits had an effective tariff rate of 20 percent or more, while the rate on fresh fruits was only 1 percent.

The average rates quoted in Table 21, however, conceal a wide disparity in tariffs on different kinds of fruits and vegetables and among various countries. This is evident for fruit juices in Table 22, where the tariff of the United States was 52 percent, Australia's was 29 percent, Japan's, 24 percent, and the European Community's, 7 percent. Similarly, for potatoes, tomatoes, and onions, the United States had the highest duty rates at 17 percent, followed by the European Community and Canada. In tropical fruits and nuts, which do not compete with the products of the industrialized countries, most of the developed countries had low duty rates. Japan was the exception with rates as high as 33 percent, compared with Switzerland at 16 percent.

The United States, more than any other country, levied specific duties rather than

Table 21—Effective tariffs in developed countries, post-Tokyo Round

Country	Vegetables		Fruits	
	Fresh	Processed	Fresh	Processed
	(percent)			
European Community	6.7	15.1	7.7	16.6
Japan	9.0	17.5	21.5	21.8
United States	7.6	11.0	1.1	20.3
Other developed nations	0.1 - 14.0	5.7 - 14.6	0.0 - 10.7	0.7 - 13.7

Source: Alexander Yeats, "The Escalation of Trade Barriers," in *The Uruguay Round: A Handbook on the Multilateral Trade Negotiations*, ed. Michael J. Finger and Andrzej Olechowski (Washington, D.C.: World Bank, 1987), p. 119.
Note: Effective tariff rates measure the influence of protection on value added in a production process.

ad valorem duties on a number of products. Thus duties were related to the quantity of the product imported, rather than its value, with the consequence that the duties were higher on low-value than on high-value products.

The duties not only varied widely among the different importing countries and commodities, but the rates varied depending on the source of the import. Lower tariff rates were applied to countries that had preferential arrangements with the major importing countries. For example, the United States had an agreement with the Carib-

Table 22—Average post-Tokyo Round tariff levels in selected major industrial countries on imports of selected horticultural products from developing countries

Commodity Group	United States	Canada	European Community	Japan	Australia	New Zealand	Austria	Switzerland
	(percent)							
Potatoes, tomatoes, and onions	17.1	6.7	13.2	5.8	0.5	. . .	0.4	0.3
Vegetables, frozen	8.3	19.1	17.8	10.0	0.6	. . .	. . .	21.4
Vegetables, preserved	15.8	0.3	2.0	15.0	8.4	. . .	3.4	3.9
Vegetables, preserved by vinegar	4.4	16.0	3.6	12.7	12.0	10.0	21.7	6.7
Vegetables, preserved, n.e.s.	11.3	10.3	8.5	21.6	14.9	0.7	11.4	3.1
Vegetables, dried	2.3	12.5	10.6	12.3	16.3	0.6	1.1	. . .
Beans and peas	1.8	0.3	0.2	3.3	7.8	. . .	. . .	0.3
Tropical fruits and nuts	0.2	. . .	5.8	33.2	0.1	. . .	0.1	15.6
Citrus fruits	6.7	. . .	4.4	12.2	. . .	. . .	6.0	8.1
Raisins	11.3	. . .	. . .	5.0	. . .	. . .	2.4	6.5
Other nuts, n.e.s.	2.3	. . .	2.5	14.9	0.7	. . .	2.4	2.7
Apples and pears	0.7	1.1	3.6	12.4	. . .	. . .	2.9	4.2
Fruits preserved by sugar	3.1	0.4	. . .	16.0	9.6	29.7	18.3	8.8
Jams and jellies	6.6	5.5	12.4	27.9	13.4	. . .	. . .	10.1
Nuts and fruits, roasted or preserved	1.8	0.4	6.2	27.0	4.8	28.9	9.3	12.5
Fruit juices including orange	51.9	0.2	7.1	24.2	28.9	1.0	8.6	11.6

Source: United Nations Conference on Trade and Development (UNCTAD), *Agricultural Trade Expansion and Protectionism with Special Reference to Products of Export Interest to the Developing Countries* (TD/B/C. 1/239), 1983, Annex, pp. 6-7.
Notes: n.e.s. is "not elsewhere specified." Ellipses (. . .) indicate little or no tariff on a product.

bean countries, and the European Community had one with the African, Caribbean, and Pacific (ACP) states. A few developed countries placed preferential rates on imports from a large number of developing countries under the Generalized System of Preferences (GSP).

Although most industrialized countries imposed low rates on tropical fruits and vegetables, there were wide differences between commodities and countries. For example, tropical nuts such as coconuts, cashews, and Brazil nuts, fresh or dried, were duty-free in many countries. But duties were imposed on some tropical nuts, including macadamia, betel and cola nuts, by Austria, Japan, Switzerland, the European Community, and the United States. Although, in general, duties on tropical fruits such as pineapples, mangoes, and avocados were somewhat low, this was not true in the United States for avocados, for example, where duties were as high as 76 percent because domestic products compete with imports. Papayas, guavas, and other fresh tropical fruits also faced duties in the markets of Japan, Switzerland, the European Community, and the United States.

The level of protection sometimes differed depending on the percentage of sugar content or the degree of processing and packaging. For example, consumer-packed juices in cans, bottles, or cartons were charged higher duties than bulk-packed fruit juices, even though the volume of trade in consumer-packed juices in developing countries was relatively small due to higher freight and packaging costs.

Nontariff Barriers

A wide-ranging set of nontariff barriers (NTBs) affects the horticultural exports of developing countries. One way of indicating the intensity or the extent of NTBs is to quantify the number of items that are subject to them. Data from UNCTAD (1984) indicates that in industrialized countries, 39 percent of fresh vegetables and 20 percent of fresh fruits were affected by NTBs. The incidence was more frequent for processed products; 48 percent of processed vegetables and 54 percent of processed fruits were subject to such barriers. The restrictive effect of NTBs on horticultural imports was considerably greater than that of tariffs, as indicated by the price spread between domestic and import prices that is created by NTBs. For example, the differentials between the import price and domestic price due to NTBs on vegetables and vegetable products ranged between 30 and 80 percent, whereas the corresponding price differentials due to nominal tariffs ranged between 7 and 13 percent. For edible fruits and nuts, price differentials due to NTBs ranged from 22 to 180 percent and for nominal tariffs, from 4 to 14 percent (UNCTAD 1984, 201).

Some of the NTBs that restrict horticultural exports of developing countries include the following. First, all major importers of horticultural products maintain a system of marketing orders that serve to regulate and protect their domestic production, These systems differ widely in their restrictive effects on horticultural trade. Marketing orders frequently specify size, grade, quality, and the desired degree of maturity or ripeness of produce.[20] Abrupt changes in the quality and packaging requirements imposed by an importing country are sometimes introduced to reduce imports. Such an incident is reported by Bredahl, Schmitz, and Hillman (1987) for exports of Mexican tomatoes to the United States. Many countries require import licensing for imports of horticultural

[20] In the early 1980s, U.S. marketing orders covered all or part of U.S. production or sale of 33 different fruits, vegetables, and nuts (Jesse and Johnson 1981).

products, which increases the transaction costs in import trade. For example, the European Community and Japan apply this to all imports of processed vegetables, nuts, and fruit juices. Austria, Finland, New Zealand, Norway, and Switzerland use discretionary licensing for horticultural imports.

Second, quotas and voluntary trade restrictions are also used quite often in horticultural trade. For example, the following products are subject to quota restrictions in the European Community (GATT 1988).

Product	Country
Bananas	France, United Kingdom, Italy, Portugal, Spain, Greece
Pineapples, fresh or dried	Spain, France, Portugal
Other fresh tropical fruit	Spain, France, Greece
Provisionally preserved fruit, jams, and prepared fruits	Portugal
Fruit juices	France, Italy, Portugal
Tomato paste from Turkey (preferential tariff)	European Community

Japan imposes import quotas on citrus fruits, orange and grapefruit juices, prepared pineapples, dried peas and beans, and some other processed items (GATT 1988). Finland and Norway apply quotas on sweetened pineapple juice. The United States imposes quotas whenever imports materially inflict or threaten to inflict damage on price support programs. France controls its imports through a national organization that reserves two-thirds of its market to French overseas departments (Martinique and Guadeloupe) and the remaining one-third to ACP countries, mainly Cameroon, Côte d'Ivoire, and Madagascar (GATT 1988).

Third, subsidies and price supports are also provided for horticultural products, along with other agricultural products, in Canada, Japan, the European Community, and the United States. For example, the European Community subsidizes various processed tomato products, canned peaches and mixed fruit, dried plums, dried figs, sultanas, and currants (Bale 1986, 10-11).[21] In 1986, about 30 percent of processed fruits received a production subsidy, which applied to about 15 different products. The total subsidy on the production of processed products equaled the annual value of the raw products before the subsidy was introduced. Export rebates are also provided for products that do not receive production subsidies, such as walnuts, almonds, and hazelnuts. Tomato products in the European Community receive price supports, subsidies on domestic processing, and export subsidies, thus intensifying EC competition in the world market for tomato products, and making it more difficult for the newly emerging exporters in the developing world to increase their share of the market.

[21] Many horticultural products in the European Community are included in the Common Agricultural Policy and therefore subject to a whole range of interventions including variable levies, reference prices, and export and production subsidies. For example, 50-60 percent of total EC supplies of fresh fruits and vegetables are covered by a reference price system. The production subsidies for some processed fruits and vegetables have increased supplies in the EC countries at the expense of third-country products. The application of the reference price system has prohibitive effects on imports of cucumbers and tomatoes in the European Community during the spring and autumn seasons. See also Alvensleben 1982.

The processing industry in Japan also is subsidized. Canada supports prices of selected fruit and vegetable products through deficiency payments and government purchases. Moreover, horticultural producers benefit from advanced payments, crop insurance programs, and subsidized storage and packaging facilities. Farm credits, loan programs, and irrigation subsidies are available to U.S. farmers.

In view of a higher incidence of protectionism on cereals and livestock products than on horticultural products, and in view of pressure from the Mediterranean EC countries to harmonize the level of protection, there is political pressure in the European Community to increase the levels of production subsidies on fruits and vegetables (Alvensleben 1982). In 1986, for example, the list of horticultural products under the reference price and intervention system was expanded. The inclusion of Portugal and Spain, with their large potential for exports of horticultural products, may further increase the pressure in this direction.

Fourth, the regulations that protect people from unsafe and unsanitary food and prevent the spread of plant diseases (phytosanitary regulations) constitute an important class of nontariff barriers in horticultural trade. They represent a complex system of specifications enforced by national and multinational plant quarantine and food sanitary laws.[22]

It is hard to distinguish unnecessary restrictions from real ones because standards and safety concerns with respect to food sanitation and disease infestation differ widely among countries. For example, regulations that result in mandatory fumigation may render imported products (such as citrus fruits) unmarketable if facilities for fumigation are unavailable. Furthermore, national standards and regulations change from time to time, sometimes abruptly or without prior notice, so that a country that is oriented toward meeting the food standards of an importing country on the basis of past practices and rules may find their exports unacceptable unless they undertake changes to meet the new standards. This creates uncertainty in export markets.

In 1984/85, for example, imports of pineapples from Mexico into the United States fell as the result of regulations on tolerance levels for residues of the pesticide, carbaryl. Again, mango imports from Mexico and Haiti into the United States suffered a setback in 1985 with the introduction of U.S. fumigation regulations to eliminate residues of the pesticide, ethylene dibromide (EDB), used to control fruit flies.[23]

In general, the application of different health standards for domestic and imported goods is an indication of discrimination against imports. Phytosanitary regulations can be characterized as trade barriers if they are very restrictive compared with those commonly applied by other countries. In Japan, for example, imports of 13 fresh fruits and vegetables are prohibited because of plant quarantine restrictions. Among the 13 are important items like apples, apricots, eggplants, nectarines, peaches, green peppers,

[22] The provisions of national food standards and regulations differ from one another in a variety of ways, ranging from composition to labeling, and these differences can obstruct the flow of international trade. If a common set of import requirements could be agreed upon, exporters could quickly transfer exports to the country where market conditions are most favorable, without concern about meeting different import requirements. Moreover, harmonization of standards would avoid the cost of reformation of products and labels to meet varying requirements. Finally, such an agreement would eliminate the drawing up of severe and unreasonable regulations for the purpose of erecting obstacles to exports from third countries (GATT 1988, 11).

[23] In 1985 U.S. regulations established a zero tolerance level, which would have eliminated all imports of fresh mangoes. A temporary tolerance level (30 parts per billion) was reestablished in early 1986 to allow imports, while efforts were made to develop alternatives. Later a treatment entailing a double dip of hot water was developed, and mango imports received approval (FAO 1987a).

potatoes, and tomatoes. The European Community has a general agreement on phytosanitary restrictions for horticultural trade between EC countries. For other trading partners, each EC country sets its own regulations, which differ by country of origin, commodity, and season.[24] Imports of all fresh fruits and vegetables to the United States are restricted unless specifically approved under the plant protection and quarantine regulations.

The United States imposes phytosanitary regulations as defined by the U.S. Food and Drug Administration. In the exporting country, the produce has to be analyzed by an independent laboratory at the cost of the trading partners. For most of the trade items and most importers, a phytosanitary certificate has to be provided and laboratory tests have to be conducted for up to 20 different plant diseases. Regulations and specifications tend to become increasingly complex over time (FAO 1987a).

Reasons that a fruit or a vegetable may not be approved for entering into the United States are as follows: (1) The Plant Protection and Quarantine Service has not studied the risk of importing that item, and no imports have taken place in the past; (2) the Service refuses to issue a permit because the item presents too great a pest risk; or (3) government agencies other than the Plant Protection Service may restrict entry due to noncompliance with standards of tolerance for pesticides and of fumigation of agricultural products. For example, in 1985 the Environmental Protection Agency eliminated the tolerance limits for inorganic bromide for a variety of fruits and vegetables. The U.S. Food and Drug Administration sets up registration and thermal process filing requirements for all low-acid canned foods; it also sets up requirements for all food additives and packaging materials.

There are also regulations regarding packaging and labeling of horticultural products. The packaging unit of processed products (can, box, other container) has to be labeled according to the laws of the importing country. For example, Canada and Japan require special labeling measures for fruits prepared by acetic acid. With growing concern about effects on health and safety of pesticide residues and processing chemicals, food, health, and labeling specifications are likely to expand.

To meet these requirements, the developing exporting countries have to set up expensive, high technology laboratories. This may also explain why the major exporters of horticultural products among the developing countries are mostly middle-income countries. Education, training, and a sophisticated level of technological infrastructure are needed to monitor phytosanitary conditions of horticultural products for export.

In an effort to harmonize the phytosanitary regulations of importing countries, a number of international organizations, notably FAO, the World Health Organization (WHO), and the Organisation for Economic Cooperation and Development (OECD), are defining international standards concerning nutrition, labeling, additives, contaminants, and pesticide residues.[25] If national standards can be harmonized, with the guidelines formulated through international consensus, it is expected that regulations

[24] For example, in the Federal Republic of Germany, the dominant importer of fruits and vegetables in the European Community, all vegetables except potatoes can generally be imported. Fresh fruits have to be free of San José scale *(Quadraspidiotus perniciosus)* and the Mediterranean fruit fly *(Ceratitis capitata)* (GATT 1988, 1-4).

[25] The Codex Alimentarius Commission (Codex) jointly organized by FAO/WHO has developed standards for a number of processed fruits and vegetables, including juices. For example, Codex international standards exist for pineapple products but not for mango products such as mango juice or canned mango. The Codex standards are not accepted by all countries as part of their national regulations and standards. Similarly, EC standards for pesticide residues are not uniformly accepted by member countries (GATT 1988).

and their purposes will become clear so that obviously protectionist components may be detected.

A developing country that wants to export a not-yet-established product often exports it through an agent in the importing country, who handles the distribution and marketing without any financial risk but for a commission. The exporter bears the entire risk. The risk is shared by the importer only when trust has developed over time between the importer and the exporter. Thus, commission sales play an important role in developing new export markets. Regulations that in some countries prohibit commission sales and require that horticultural imports must have a prearranged buyer tend to inhibit new, nontraditional exporters.

Effects of Enlargement of the European Community on Horticultural Trade of Developing Countries

The integration of Greece, Portugal, and Spain into the European Community—to be completed in 1990—is likely to affect the horticultural exports of developing countries. This is especially true for those products that the developing countries either export to the EC countries or sell in the world market in competition with the European Community.

Because the three new members are substantial producers and exporters of horticultural products, their integration affects not only the other members of the Community but also other countries that export horticultural products. The Mediterranean countries are likely to be most affected because the output composition of their horticultural exports is highly competitive with that of the new members. The new members once fully incorporated into the system of domestic price supports of the European Community, including production and export subsidies, are expected to increase their production of horticultural products. Part of their increased output will find markets within the European Community and part in external markets. At the same time, EC countries are likely to divert their purchases from the non EC countries to the member countries. The magnitude of the impact on world exports and hence on prices in world markets depends on many factors, such as the elasticity of output in new member countries, elasticity of export supply in other EC countries, long-run trends in export supply in and out of the European Community, as well as the elasticity of demand in the European Community and in the rest of the world. A study by Bale (1986) indicates that there is a possibility of downward pressure on prices due to an increase in supply relative to demand. Even though the overall effect on prices of horticultural exports is not likely to be large, price declines, and thus the adverse effects on export markets of individual products and commodities, may not be negligible.

A 1982 study estimated that the enlargement would have a substantial effect on exports of the Mediterranean countries (Cyprus, Egypt, Morocco, Tunisia, and Turkey) in the following commodities: vegetables, potatoes, onions, tomatoes, zucchini, tomato concentrates and juice, and fruits including watermelons, melons, citrus fruits, grapes, dried figs, raisins, canned olives, and apricots. The rest of the developing world would also be substantially affected in the following commodities: green beans, tomato concentrates, dried figs, and raisins (Alvensleben 1982).

The study by Bale (1986) estimates the extent of a possible decline in prices as a result of the EC enlargement in commodities. The range of decline in prices depends upon different assumptions regarding supply and demand elasticities. The higher range of price declines seems mostly to affect the vegetable products. For example, in the

case of zucchini, eggplant, cucumber, and artichokes, the expected price declines (maximum range) are high (10-12 percent), whereas the growth rates for developing-country exports of these vegetables in 1975-85 have been very high (11-20 percent). The commodities that enjoyed the highest export growth rates in the past and that are predicted to have a high trend rate of growth of export supply in the future are likely to suffer the sharpest declines in prices. Two of the commodities that are expected to suffer price declines—strawberries and almonds—have already experienced a drop in the value of exports in 1975-85.

An associated question relates to the impact of the economic integration of Europe in 1992 on horticultural trade. To what extent it will affect the Common Agricultural Policy (CAP) depends partly on the agreements reached on the liberalization of agricultural trade under the Uruguay Round, which is scheduled to be completed by 1990. It is unlikely that the elimination of all border restrictions on trade within the EC countries by 1992 will have additional substantial adverse effects on the exports of developing countries, beyond what they have already sustained as a result of CAP. It is possible, however, that insofar as the processed horticultural products are concerned, the establishment of uniform standards relating to quantity and safety or a harmonization of such standards within the Economic Community will result in adoption of the standards of the country that has the strictest standards. This may adversely affect exports from developing countries, at least in the short run, if they are unable to adjust quickly to these standards.

Effects of Trade Liberalization

The consequences of reduction in trade barriers in Japan, the European Community, and the United States, the leading importers of horticultural products from developing countries, are assessed in this section. A partial equilibrium approach is used, although such an approach cannot analyze the economy-wide or secondary effects of trade liberalization, including exchange rate changes. Nevertheless, its use is justified in view of the small share held by the horticultural sector in agriculture and in the overall economy. In spite of their limitations, these estimates provide some indication of the orders of magnitude.

The liberalization of trade barriers by developed countries would increase both the quantity of world exports and a rise in world prices. If the supply is infinitely elastic, however, only the quantity of world exports would expand, and prices in the world market would be unchanged.

Following the liberalization of trade, consumers and producers in the developed countries will face a decline in domestic prices, leading to an adjustment in both domestic consumption and production and therefore to a change in net trade. A rise in the world price confronting producers and exporters in the developing countries will have the opposite effect; domestic production will be stimulated and consumption will be discouraged, leading to a rise in exports.[26]

The consequences of trade liberalization through a reduction in tariffs are estimated for four major categories of horticultural exports: fresh vegetables, processed vegetables, fresh fruits, and processed fruits. Insofar as the analysis of the reduction in the NTBs is concerned, data on the nominal equivalents of NTBs are not readily available. Some

[26] The model used for estimation of the effects of liberalization is described in Appendix 2.

estimates for total fruits and total vegetables, without a distinction between fresh and processed products, are available for Japan and the United States. For the European Community, estimates are only available for France, and these are assumed to be valid for the Community as a whole.

Estimates of import demand and export supply elasticities are critical for assessing the effects of liberalization of trade. Information on the relevant elasticities for horticultural products is scarce, and information on export supply elasticities is even more scarce. Hence, a sensitivity analysis is used in these exercises, that is, a range of elasticities are used for both import demand and export supply. Many studies on the effects of trade liberalization on agricultural products assume that export supply elasticity is large on the basis that exports are frequently a small proportion of aggregate domestic production. However, it is pertinent that, for all categories of horticultural products, those sold in the domestic market are not close substitutes for those exported, especially in quality. Furthermore, while the elasticities of import demand and export supply may be high for individual horticultural products, they are unlikely to be so for large groups of products or for total horticultural products. In this exercise, it is assumed that import and export demand elasticities vary between 0.5 and 1.0, following the results of the price elasticity estimation in Chapter 4. They are broadly in line with estimates for individual groups of horticultural products made in various studies, as reported in Appendix 2.

The alternative estimate of the increase in export revenues based on different assumptions regarding the export supply and import demand elasticities is presented in Table 23. The maximum increase in earnings from total horticultural exports resulting from the elimination of tariffs by the United States, the European Community, and Japan' is estimated to be 9 percent. If NTBs were totally eliminated, the maximum increase in export earnings is estimated to be about 36 percent. The minimum increase in export earnings is 6 percent due to elimination of tariffs, and 24 percent due to elimination of NTBs. This assumes that NTBs are the dominant import constraint and that tariffs are not effective under NTBs. The effect of the elimination of the NTBs—the total price differential between the import and the domestic price—already subsumes the effects of the elimination of tariffs. Therefore, the effects of the elimination of tariffs are not additive. Although some individual commodities are only subject to tariff barriers (not NTBs), it is assumed that the tariff and the NTBs prevail simultaneously at the group level of horticultural products or total horticultural products, and that the latter is the effective trade barrier.

Under the scenario where tariffs are eliminated, the percentage increase in export earnings is higher for fruits than for vegetables. That also holds true for fresh fruits compared with fresh vegetables and for processed fruits compared with processed vegetables.

Sixty-eight percent of the total increase in export earnings following the elimination of tariffs is accounted for by fruits primarily because a much larger quantity of fruits are exported than vegetables. But 62 percent of the total increase in export earnings is accounted for by processed horticultural products, primarily because duty rates on processed products are higher.

Eighty percent of the increase in total earnings consequent to the elimination of the NTBs is accounted for by fruits because the incidence of NTBs is much higher in fruits, and the initial quantity of exports of fruits is higher.

The maximum increase in the export revenues of the developing countries is estimated at US$850 million if only tariffs are eliminated, and at US$3.3 billion if the NTBs are also eliminated. The question may be raised, however, as to whether the

Table 23—Increase in export earnings as the result of liberalizing trade by removing tariff and nontariff barriers, 1983-85

Commodity Group	Import Elasticity	Export Elasticity 0.5	1.0
With tariffs removed		(US$ million)	
Fresh vegetables	-0.5	45	57
		(3)	(4)
	-1.0	54	75
		(3)	(5)
Processed vegetables	-0.5	108	136
		(5)	(6)
	-1.0	136	193
		(6)	(9)
Total vegetables (fresh and processed)	-0.5	153	193
		(4)	(5)
	-1.0	190	268
		(5)	(7)
Fresh fruits	-0.5	183	173
		(6)	(5)
	-1.0	235	250
		(7)	(8)
Processed fruits	-0.5	237	246
		(11)	(11)
	-1.0	287	334
		(14)	(16)
Total fruits (fresh and processed)	-0.5	420	419
		(8)	(8)
	-1.0	522	584
		(10)	(11)
Fresh fruits and vegetables	-0.5	228	230
		(5)	(5)
	-1.0	289	325
		(6)	(7)
Processed fruits and vegetables	-0.5	345	382
		(8)	(9)
	-1.0	423	527
		(10)	(12)
Total fruits and vegetables	-0.5	573	612
		(6)	(7)
	-1.0	712	852
		(8)	(9)
With nontariff barriers removed			
Vegetables	-0.5	391	469
		(10)	(12)
	-1.0	499	677
		(13)	(18)
Fruits	-0.5	1,830	1,680
		(35)	(32)
	-1.0	2,480	2,590
		(47)	(49)
Total fruits and vegetables	-0.5	2,221	2,149
		(24)	(24)
	-1.0	2,979	3,267
		(33)	(36)

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: Numbers in parentheses are percentage changes.

increase in export earnings is overestimated, because these estimates do not take into account that the exports from the ACP countries to the European Community and from the Caribbean Basin Initiative (CBI) countries to the United States are currently duty-free, and in many cases also free from nontariff barriers. However, the share of CBI countries in total horticultural imports of the United States is no more than 3 percent (USDA 1988, 8-11). Similarly, in the case of the European Community, most of the ACP countries are not important exporters of horticultural products. Among the 31 major exporters, only two are from the ACP group—Côte d'Ivoire and Kenya. The ACP countries as a whole do not contribute more than 12 percent of total horticultural imports of the European Community from the developing countries (Stevens and Themat, 1987). Therefore, estimates of increases in export earnings are not significantly different, even if the restriction-free access of ACP exports to the European Community is taken into account.

Estimates of increases in export earnings following a liberalization of trade by the major developed importing countries may be compared with similar estimates given in other studies for selected horticultural products or groups of products. A recent study by UNCTAD of selected horticultural products or groups of products (13 groups) provides the following estimates of the percentage increase in export earnings over the 1980 value of imports as the result of liberalization by the United States, Japan, and the European Community (UNCTAD 1985, 213).

	Percent
Selected fresh products	7
Selected processed products	18
Average of the two groups together	15

These estimates include the result of the elimination of tariffs and NTBs. The largest increases were in processed fruits and nuts (40 percent), fruit and vegetable juices (33 percent), vegetable products (12 percent), and processed vegetable products like potatoes (24-26 percent). The figures above represent the weighted average of 13 selected commodity groups only—not all horticultural products. The size of the price differential accounted for by the NTBs is unknown. However, import demand elasticities are assumed to vary between 0.6 and 0.4. The export supply elasticities are not given.

An alternative analysis of the effects of liberalization on seven selected horticultural products yields estimates of increases in export earnings ranging from 52 percent for potatoes to 4 percent for bananas. The weighted average increase in the export earnings for the seven commodities is 13 percent.[27] However, most of the products included are fresh, which have a lower level of barriers or restrictions.

The estimates of the increase in export earnings resulting from the elimination of the NTBs, as given above, are likely to be biased upward, even though the export

[27] The import demand elasticities vary within a wide range in the study—from -7.6 for potatoes to -0.4 for bananas, for example. Export supply elasticities are assumed to be consistently higher than import demand elasticities; they range from 9.5 for grapes to 1.7 for bananas. It should be noted, however, that the consequences of liberalization indicated here refer to all OECD countries, not limited, as in the present study, to the European Community, Japan, and the United States. The increases in export earnings over 1977 from each of the seven horticultural products are as follows: potatoes, 53 percent; apples, 23 percent; grapes, 76 percent; lemons and limes, 19 percent; dry beans, 7 percent; oranges, 6.4 percent; bananas, 4.3 percent; and shelled peanuts, 4 percent.

supply elasticities assumed in the present exercise are lower than what is normally assumed in other studies of this kind. However, the results are much more sensitive to variations in demand elasticities than those in supply elasticities. There are several reasons why an upward bias is probable. First, without data on the NTBs on individual fruits and vegetables or on fresh products as distinguished from processed products, the price differentials used in this exercise relate only to two broad groups of horticultural products. Furthermore, the measures of price differentials used in the study do not include all fruits and vegetables, even though they are deemed to represent the price differentials for other commodities as well. From limited evidence, it appears that the items excluded have smaller price differences than the items included.

Second, the average price differentials for groups of commodities are unweighted. Since the subgroups with higher price differentials are likely to have smaller volumes of import or export because they have a greater restrictive effect on trade, the unweighted averages are likely to be higher than the weighted averages.

Third, the price differential for France is used for the European Community, since data for the European Community as a whole is not available. France seems to have higher NTBs than other members of the European Community. It should also be noted that the price differentials due to NTBs vary significantly from year to year, depending upon the world prices. The price differentials used in the study relating to the mid-1970s may not truly represent the current situation. In spite of these limitations, however, the estimates indicate a broad order of magnitude for increases in export earnings flowing from liberalization of trade in horticultural exports of developing countries.

Liberalization of Trade Between Developing Countries

The foregoing discussions have focused on the import restrictions of developed countries and their consequences for the exports of developing countries. Although developing countries account for only 17-18 percent of world imports, they have increased their share of world trade. Furthermore, they also impose restrictions on imports of horticultural products. A liberalization of such restrictions would stimulate imports and constitute an expansion of world trade, in which exporting developing countries are expected to share.

Developing countries imposed both tariffs and NTBs on their imports of horticultural products in 1981. The structure of tariffs on four different classes of horticultural products in 1981 is shown below, along with the share of developing countries in total imports of each category (Laird and Yeats 1988).

Commodity Group	Tariff Rate	Share of Imports from Developing Countries
	(percent)	
Fresh fruits	47.1	57.3
Processed fruits	73.3	27.3
Fresh vegetables	39.3	41.4
Processed vegetables	48.2	15.6

First, the tariff rates imposed by developing countries were five-to-eight times higher than those of developed countries, and tariff rates on processed products were higher than those on fresh products. Fruits escalated more than vegetables, but in general the

degree of escalation was less than that of the developed countries. The tariff rates imposed by developed countries on processed vegetables were about 50 percent higher than those on fresh vegetables, but in the developing countries, they were barely 20 percent higher. For processed fruits, the tariffs of developing countries were 50 percent higher than those on fresh fruits, whereas in the developed countries, the rates were almost three times higher.

The proportion of imports obtained from other developing countries was much higher for fresh than for processed fruits. About 70-85 percent of imports of processed products were obtained from developed countries.

NTBs were also quite high in the developing countries. Table 24 indicates the nature and intensity of quantitative restrictions placed on horticultural imports for a sample of developing countries and commodities.

What is the possible magnitude of the effect if developing countries eliminate tariff barriers on their imports from other developing countries, that is, if they engage only in intradeveloping-country trade liberalization? It has been estimated that they are likely to increase their imports by 7-8 percent over 1981.[28] Since the developing countries' share of imports is 49 percent for all fruits and 35 percent for vegetables, the liberalization only applies to a small share of the import trade on a preferential basis. In other words, the tariff barriers on the rest of their imports, derived from developed countries, are not eliminated. Furthermore, it should be noted that the estimates of increased trade relate only to the elimination of tariff barriers and not to NTBs, which remain unchanged.

Horticultural Products in the Uruguay Round

The prospects for liberalization of trade in horticultural products in the future are linked with the success of the Uruguay Round of the Multilateral Trade Negotiations.

The Uruguay Round of trade negotiations on agricultural commodities is carried out by two separate committees, the Committee on Agriculture and the Committee on Tropical Products. The latter explicitly includes seven product groups for negotiations; one of them is tropical fruits and nuts. There is no mention of other fruits or vegetables. This implies that other fruits and vegetables are covered by the Committee on Agriculture, if not by the Committee on Tropical Products. The distribution of the different agricultural commodities into two committees is a matter of negotiation between the contracting parties. The implicit understanding, at least in the early stages, was that the category defined as tropical commodities was of special interest to the developing countries; furthermore, with respect to most of these commodities, developed and developing countries did not compete much in world trade. Therefore, liberalization of trade could be undertaken to a greater extent and at a faster rate without adversely affecting exports or domestic production in the developed countries. As, at present, there is neither a strict definition of tropical products nor a set of criteria to establish one, it is possible that, as negotiations progress, additional commodities may be included, such as citrus fruits, in which developing countries compete with developed countries.

Two provisions of the GATT negotiating mandate, which are already agreed upon, are relevant in the context of liberalization of trade in horticultural products because

[28] This estimate is based on the following assumptions: the elasticity of supply of exports for developing countries varies between one and infinity, and the elasticity of substitution between preference-receiving and other sources of supply is rather low, 1.5 percent.

Table 24—Quantitative import restrictions imposed by selected developing countries

Country	Commodities Banned or Under Quantitative Import Licensing Quotas
Brazil	Fruit and vegetable preparations
Colombia	Prunes
Ecuador	Fresh fruits
Venezuela	Apples, pears, raisins, and canned fruits
Egypt	Raisins, oranges, and almonds
Korea	Fresh fruits, nuts, vegetables, canned and frozen fruits
Indonesia	Fresh fruits, fruit juices, canned fruits, raisins and nuts
Philippines	Fresh apples, pears, grapes, oranges, limes and lemons, and other citrus fruits

Source: Based on data from USDA (U.S. Department of Agriculture), *Trade Policies and Market Opportunities for U.S. Farm Exports: Annual Report* (Washington, D.C.: USDA, 1987).

they cover items that fall under the category of tropical products, including bananas and roots and tubers (except cassava). According to UNCTAD's (1988) report on the Uruguay Round, "Negotiations shall aim at the fastest liberalization of trade in tropical products, including processed and semiprocessed forms, and shall cover both tariff and nontariff measures affecting trade in these products." And, "the contracting parties recognize the importance of trade in tropical products to a large number of less developed contracting parties and agree that negotiations in this area shall receive special attention, including the timing of negotiations and the implementation of the results" (UNCTAD 1988, 356). It is clear that tropical products are given priority status; thus accelerated negotiations and early implementation are indicated.[29]

Do the developed countries require reciprocity from the developing countries in negotiations on tropical products? Even though the case for separate and differential treatment for developing countries has been made in the Uruguay Round, so that developing countries are not expected to make concessions inconsistent with their development, trade, and financial needs, the more advanced developing countries will be expected to make reciprocal concessions. Even though tropical products are considered an area where reciprocity is less relevant, in the various trade liberalization offers already made by developed countries, reciprocity is expected from developing countries. However, it is implicitly understood that no equivalent concessions in terms of tariff reductions are expected. It is a question of relative reciprocity; the less-advanced developing countries will probably not be asked for any reciprocal liberalization. Furthermore, concessions given in other sectors may be considered in exchange for concessions received in this sector.

[29] Following the GATT Midterm Review of the Uruguay Round in April 1989, the contracting parties agreed to pursue the following negotiations on the seven agricultural and tropical product groups: "(a) elimination of duties on unprocessed products; (b) elimination or substantial reduction of duties on semi-processed and processed products. These actions would include the objective of eliminating or reducing tariff escalations. (c) elimination or reduction of all nontariff measures affecting trade in these products" (GATT 1989). One of the seven product groups specified in this declaration is tropical fruits and nuts.

The GSP for developing countries is not important for agricultural commodities; it is relevant only for processed agricultural goods, including processed horticultural products. But these preferences are unilaterally and selectively given on a voluntary basis to designated countries and for specific commodities; they can be and often are withdrawn at the discretion of the preference-giving country. In light of the insignificance of these preferences, it is worth considering whether the developing countries are likely to derive a greater advantage from the elimination or substantial reduction of trade restrictions, both tariff and nontariff, on a most-favored-nation basis, than from a highly uncertain and limited preferential scheme affecting tariffs only. What is most important for the future growth of horticultural exports of developing countries is a liberal trade regime, and its stability and certainty over time, since many of the exports are new, having been introduced in world trade only in recent years. They require investment in export infrastructure, including marketing and distribution facilities. The prospects of future market development are likely to be brighter for processed products than for fresh. In this regard, tariff escalation or trade restriction increasing with the degree of processing is important. Without a substantial liberalization of trade in processed horticultural products, the future expansion of exports will be limited.

Regarding the demand for reciprocity by developed countries, the developing countries should seriously examine whether liberalization of trade among themselves on a preferential basis can be offered as a suitable reciprocal contribution on their part with respect to trade not only in horticulture but also in agriculture and manufactured goods.

The GATT negotiations on sanitary and phytosanitary regulations are particularly important for horticultural products. The GATT Midterm Review agreed to harmonize

> sanitary and phytosanitary regulations and measures on the basis of appropriate standards established by relevant international organizations; . . . also, to ensure transparency and the existence of an effective notification process for national regulations or bilateral agreements; to allow a consultation process which ensures an opportunity for the bilateral resolution of disputes; to improve the effectiveness of multilateral dispute settlement process; to provide necessary input of scientific expertise and judgment, relying on relevant international organizations (GATT 1989).

An important commitment is to "assess the possible effects on developing countries of the GATT rules and disciplines for sanitary and phytosanitary measures and evaluate the need for technical assistance" (GATT 1989). This is of particular importance to the developing countries in view of the crucial role of such regulations in determining the flow of trade in horticultural products.

6

FUTURE PROSPECTS OF HORTICULTURAL EXPORTS OF DEVELOPING COUNTRIES

The horticultural exports of developing countries have experienced dynamic growth since the 1960s. Although growth slowed in 1975-85, it was still higher than that of agricultural exports as a whole. What are the future prospects? This depends on the growth of demand in both developed and developing countries, and on the possibility of developing countries' maintaining or increasing their competitive strength in world markets.

The high income elasticity of demand for horticultural products has been frequently noted. In many developed countries, however, per capita consumption of horticultural products is quite high, and the prospects for further rapid expansion of demand are low. Even if the aggregate volume of consumption does not expand rapidly, it is likely that demand for imports of horticultural products from abroad, especially tropical products, may grow at a faster rate than aggregate demand for horticultural products. Because of the increasing trend toward diversification of the pattern of consumption of horticultural products, there is an increasing need for developing countries to explore and exploit the opportunities for exporting specialized products to developed-country markets—often directed toward particular consumer groups—by enhancing price competitiveness and improving quality. In many products the market is thin either because total trade volume is small or the number of transactions is limited. The market imperfections include oligopoly or monopolistic power in trade, with exports from a few countries exerting strong influence on market prices; economies of scale that constitute a barrier to entry of new exporters or competitors; steep learning curves for new entrants either in production techniques or in the handling, marketing, and processing of horticultural products; and cumulative advantages earned by early entrants in the export market or by established exporters from an early start in research, development, and innovations.

The developed countries will remain the largest market for horticultural exports, including those from developing countries. Export markets in developed countries are segmented for many products. The luxury market is that segment of the market that caters to high-income groups, including specialty restaurants. This market requires high-quality, fresh (in the case of fruits, full-ripe) fruits and vegetables, which fetch high prices. Produce is most often transported by air. Then there is the mass market for fruits and vegetables, which caters to the consumption needs of the middle-to-low income groups. These sell for lower prices, are predominantly transported by ship, and are frequently frozen or otherwise preserved. The price differential between the two categories may be large, often as much as 40-50 percent. For example, in the European market, pineapple from Kenya is a luxury item, whereas pineapple from Côte d'Ivoire is sold on the mass market (FAO 1985).

There are two additional market segments for tropical fruits. There is, first, a low-value market for fruits that are to undergo further processing for use as inputs in such final products as drinks, dairy products, and bakery or confectionery products. Second, there is the market for the higher-priced fresh, frozen, or processed fruits that are consumed directly. The requirements for packaging, labeling, and health standards are less stringent for the first market than for the second.

There is an additional distinction between off-season markets and year-round markets in developed countries. Horticultural products from developing countries have access to a larger, more open export market during seasons when the temperate developed countries are not producing their own fruits and vegetables. These seasons are short-lived, however, and imports in adequate quantity must be available at just the right times, which greatly depends on efficient transportation and distribution facilities in the exporting countries.

As was seen in an earlier chapter, regional markets or markets of neighboring countries assume more importance for horticultural exports, due to the high cost of long-distance transportation, the perishability of fresh products, and the similarity of tastes and consumer preferences. Measures to expand intradeveloping-country trade could play a critical role in future expansion of horticultural exports.

The market for most tropical horticultural products is now largely immigrant populations in developed countries, although it is slowly expanding to indigenous populations as the latter are exposed to the consumption habits of immigrant groups, partly through restaurants and foodshops. Imports of tropical horticultural products are higher in countries that have significant immigrant populations or historical links to tropical countries, such as past colonial relationships. The United States, the United Kingdom, Japan, and France are among the countries that fit this description, and they constitute the main markets for tropical horticultural products. Future growth of trade in tropical horticultural products will depend on how rapidly consumption spreads among the indigenous population. Education of potential consumers through promotional activities such as advertising holds the key to the future of such exports.

In a few cases, an increase in imports of horticultural products will result not from an expansion of aggregate domestic consumption but from substitution of imports for domestic production due to a shift in the consumption pattern away from traditional domestic products to new imported products. In Japan, for example, recent increases in imports of vegetables are not the result of an increase in the aggregate consumption of vegetables. Instead, the consumption pattern has diversified, with imported vegetables replacing domestically produced vegetables (Asian Vegetable Research and Development Center 1988, 152-170).

In light of these considerations, the potential for increased consumption and imports of horticultural products in developed countries can partly be gauged from the wide differences that currently prevail in per capita consumption of fruits and vegetables among individual countries. This is in spite of broad similarities in general patterns of food consumption, consumer preferences, and living standards. In Western Europe, for example, in 1983-85 per capita consumption of vegetables varied from a high of 221 kilograms in Italy to 180-192 kilograms in the United Kingdom and France and to 131-124 kilograms in Switzerland and Sweden. For individual vegetable products, per capita consumption varied widely: consumption of pulses, for example, was 3.7 kilograms in Italy, 1.9 kilograms in France, and 0.4 kilogram in Sweden. Per capita consumption of fruits varied from 140 kilograms in Switzerland to 131-116 kilograms in Italy and the Federal Republic of Germany and to 56 kilograms in the United Kingdom. Japan's per capita consumption of fruits, at 63 kilograms, was significantly lower than the average for Western Europe, at 102 kilograms, and for the United States, at 151 kilograms, the high (FAO 1985, Table 5.9).

It is expected that over time, countries with currently low per capita consumption of fruits and vegetables will increase their consumption in response to a rise in consciousness that plant protein is healthier than animal protein. Moreover, the desire to diversify the diet should lead to increased consumption as consumers become familiar with a

wider variety of fruits and vegetables and more are available as the result of improved international transportation, distribution, and marketing systems. Sales promotion by marketing and distributing agencies or organizations in importing countries can contribute greatly to future expansion of demand (Commonwealth Agricultural Bureau 1980, chapter 5).

Two requirements are critical to future growth in exports of horticultural products from developing countries: first, efficient marketing infrastructure in the exporting countries, including reliable domestic and international transportation systems, and, second, close links with effective distribution systems in the importing countries.

Transportation is of paramount importance, especially where perishable products are concerned. They require suitable vehicles and containers and correct loading and storage facilities, so that quality is not adversely affected. Transportation costs constitute a large share of the total wholesale or retail price. The cost of airfreight for tropical fruits and vegetables frequently accounts for 30-60 percent of the sale price in the European market.[30] A reduction in the transportation cost would have a significant effect on prices and demand for horticultural products.

At the same time, the marketing and distribution margins are extremely high. For example, the retailer's margin above the buying price for imported products in supermarket chains in the United Kingdom is about 25-30 percent, whereas it is 50-60 percent in independent groceries.[31]

Airfreight continues to face such problems as lack of cargo space, unreliable capacity allocation, unsuitable itineraries, and inequality between inbound and outbound transport demand. And, even though technological advances such as precooling, refrigerated containers, and controlled atmospheric storage have improved seafreight, it still faces such problems as delay in transportation, long lead time for delivery, and lack of port facilities. The cargo capacity of a ship may be too large for the small volume of shipment of a particular horticultural product, and the possibility of combining various items for shipment is often not considered.

Close links with the distribution systems in importing countries are needed, in view of the concentration of trade in those countries and the tendency for shipping and sales schedules to be programmed well in advance. Such links are also needed to obtain precise information on the requirements of export markets regarding quality and packaging and to undertake promotional activities. Promotional activities are time consuming and expensive. The introductory period to familiarize consumers with a new product can extend over many years. During this period, imports are likely to be small.[32]

While the availability of market intelligence and knowledge of trade regulations are important factors in horticultural trade, there is no organized system of market intelligence for horticultural products comparable to what exists for other agricultural products. The International Trade Center (UNCTAD/GATT) provides an Interregional Multiproduct Market News Service to disseminate up-to-date information on prices, supply, and demand in importing countries that is far from adequate. The lack of basic information at the country level is a serious handicap because of the wide variety of

[30] Airfreight rates to Europe per kilogram are US$0.40 from West Africa, US$0.70 from Kenya, US$1.00 from Mexico, US$1.20 from Brazil, and US$2.50 from Southeast Asia (Joy 1987).

[31] This is especially true for imports of tropical fruits and vegetables from developing countries (Hallam and Molina 1988, 2-3).

[32] The success of two fruits—avocados and kiwi fruit—illustrates the importance of promotional activities. In 1985, Israel spent US$113,000 for advertising the avocado. Kiwi fruit had been known in the United Kingdom for many years under the name Chinese gooseberry without having significant market impact until New Zealand appropriated, renamed, and promoted it (Hallam and Molina 1988, 31).

items involved. The amounts of many items traded are so small that they do not attract adequate attention from the national trade intelligence and statistical services.[33]

Projections of Developing-Country Exports

To assess the future prospects of horticultural exports of developing countries, the following procedure is followed. First, aggregate demand for fruits and vegetables in the different regions of the world in the year 2000 is projected. Second, assumptions are made about the share of imports in the aggregate consumption of fruits and vegetables in different regions. Third, an assumption is made regarding the share of developing countries in world trade in the year 2000. The projections are made for the volume of exports in 2000 and the value of exports, which is derived from the unit price of exports for the period 1983-85.

The rates of growth of aggregate demand for fruits and vegetables in Table 25 are based on FAO projections of demand for the year 2000, on the basis of assumed rates of growth in income and population. Estimated income elasticities of demand are given in Table 26. Aggregate demand in the developed countries, including the centrally planned developed economies, is projected to grow by 1.6 percent a year for fruits and 0.8 percent for vegetables. The rates of growth in developing countries are projected at 3.5 percent for fruits and 2.9 percent for vegetables (Table 25).

Among the different commodity groups, fruits are projected to grow the most and vegetables the least in developed countries. However, when potatoes are excluded from the vegetable category, the growth rate for vegetables rises sharply.[34] It is worth noting that the projected rate of increase in the aggregate demand for fruits and vegetables (excluding potatoes) in developed countries is higher than that of cereals, coarse grains, and meat. The rate of increase in aggregate demand for horticultural products in developing countries is more than twice that in developed countries. Compared with centrally planned economies, the rate of growth in demand is 25 percent higher for fruits and 65 percent higher for vegetables (excluding potatoes). The rate of increase in aggregate demand for vegetables (including potatoes) was three-to-five times higher in developing countries than in either the centrally planned or market economy developed countries.

Differences in the rates of growth in demand are due partly to differences in projected income and population growth rates and partly to differences in income elasticities of demand, which are dependent on the level of per capita income and consumption reached in various country groups. At 1.9 percent, the projected population growth rate for developing countries is higher than that for developed countries. Among the developed countries, the population growth rate for North America, at 0.8 percent, is projected to be higher than that of Western Europe (0.2 percent). The income growth rate is projected to be higher for developing countries (4.9 percent) and for the centrally planned economies of Eastern Europe (3.7 percent) than for the developed market economy countries (3.3 percent) (Table 25). The assumed income elasticities of demand for horticultural products for the different country groups, along with per capita consumption in 1984, are shown in Table 26.

[33] The signatories of the Lomé Convention between the European Community and the ACP countries have established an organization of European importers and exporters of fruits and vegetables, both tropical and off-season, which provides market intelligence services for both exporters and importers in member countries (FAO 1989b).

[34] Because potatoes are such a dominant part of total vegetable demand, two separate projections are made for vegetables—with potatoes and without.

Table 25—Projected annual rates of growth of aggregate demand, 1984-2000

Commodity	Developed Market Economies	Developed Centrally Planned Economies	Developing Countries
		(percent)	
Growth of aggregate demand			
All cereals	0.95	1.07	2.64
Coarse grains	1.06	1.22	3.40
Meat	1.00	1.32	3.85
Fruits	1.31	2.82	3.54
Vegetables	0.66	0.81	2.91
Vegetables, excluding potatoes	1.08	1.80	2.98
Population growth	0.60	0.70	1.90
GDP	3.30	3.70	4.90

Sources: Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988; and data on horticultural products compiled by the author from various FAO sources.

In general, demand elasticities are higher for fruits than for vegetables in all country groups. Elasticities are highest in the developing countries and lowest in the developed market economies. Per capita consumption of vegetables is similar in market economy countries and centrally planned developed countries, but consumption of fruit is much higher in the market economy countries. Per capita consumption of both fruits and vegetables is much lower in the developing countries, and, as incomes rise, significant increases in demand are expected to take place.

Based on estimates of the proportion of aggregate demand met by imports, two alternative import demand projections are made: one assumes that the 1984 ratio of imports to aggregate demand is unchanged, the other assumes that changes will continue in line with past trends in the import ratio since the 1960s. According to the first assumption, world import demand will rise 1.7 percent per year for fruits, 1.3 percent for vegetables, and 1.5 percent for vegetables excluding potatoes (Table 27). Under the second assumption, world import demand increases at a much higher rate: 3.1 percent per year for fruits, 3.9 percent for vegetables, and 4.0 percent for vegetables excluding potatoes.

Table 26—Income elasticities of demand and per capita consumption of horticultural products, by country group, 1984

Country Group	Income Elasticity of Demand		Per Capita Consumption	
	Vegetables[a]	Fruits	Vegetables[a]	Fruits
Developing countries	0.61 (0.30-0.90)	0.68 (0.28-1.17)	43.43	38.63
Developed market economy countries	0.25 (0.10-0.40)	0.38 (0.25-0.60)	101.00	92.95
Eastern Europe and U.S.S.R.	0.43 (0.30-0.60)	0.64 (0.34-0.82)	104.85	54.75

Source: Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome 1988.
Note: The numbers in parentheses indicate the range of variation in income elasticities of demand.
[a]Excludes potatoes.

Table 27—Projected annual rates of growth of aggregate and import demand for fruits and vegetables, by region, 1984-2000

Region	Growth Rate of Total Demand	Ratio of Imports to Demand		Growth Rate of Import Demand	
		Scenario I	Scenario II	Scenario I	Scenario II
			(percent)		
Fruits					
North America	1.34	26	29	1.34	2.09
Western Europe	1.01	22	29	1.01	2.67
Oceania	2.15	8	9	2.15	3.03
Japan	2.14	15	24	2.14	5.19
Eastern Europe and U.S.S.R.	2.82	8	10	2.82	3.92
Developed countries	1.64	18	23	1.37	2.82
Developing countries	3.54	3	3	3.54	4.50
World	2.68	...	...	1.73	3.09
Vegetables (including potatoes)					
North America	0.83	7	12	0.83	4.50
Western Europe	0.39	12	18	0.39	2.97
Oceania	1.23	3	6	1.23	6.17
Japan	1.43	4	12	1.43	9.41
Eastern Europe and U.S.S.R.	0.81	1	1	0.81	3.66
Developed countries	0.76	4	7	0.58	3.85
Developing countries	2.91	1	1	2.91	4.18
World	2.31	...	...	1.30	3.93
Vegetables (excluding potatoes)					
North America	1.07	10	18	1.07	4.89
Western Europe	0.85	17	22	0.85	2.60
Oceania	1.45	5	10	1.45	6.20
Japan	1.63	5	11	1.63	7.41
Eastern Europe and U.S.S.R.	1.80	2	2	1.80	2.97
Developed countries	1.32	9	13	1.02	3.60
Developing countries	2.98	2	3	2.98	5.02
World	2.47	...	...	1.54	3.96

Source: Calculated from data in Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988.
Notes: In Scenario I, a constant ratio of imports to demand in 1984 is used for projections. In Scenario II, trend functions are estimated to obtain the projected ratio of imports to aggregate demand in the year 2000.

A rise in the import ratio—the proportion of aggregate demand met by imports—is the main factor contributing to the increase in import demand of the major developed market economies (Table 27). Specifically, the increase in the import ratio of Japan is projected to be large, rising from 15 percent in the base year to 24 percent in the year 2000 for fruits and from about 4 percent to 12 percent for vegetables (with potatoes). In Eastern European countries, including the U.S.S.R., the ratio is projected to stay low. In all regions, the import ratio is much higher for fruits than for vegetables—as high as 29 percent in North America and Western Europe. However, the trend rate of increase in the import ratio is projected to be much higher in vegetables than in fruits, mainly because the import ratio for vegetables was low in the base year.

In this exercise, it is also assumed that world exports will expand to match the increase in world imports without affecting equilibrium prices in the base year. If developing countries maintain their current share in the quantity of world horticultural exports, the projected quantity of exports would vary between 28 and 37 million metric tons (Table 28). In other words, exports are projected to grow between 1.6 percent and 3.4 percent a year. Developing countries will export more than twice as many fruits as vegetables by the year 2000. The total value of exports is projected to range

Table 28—Quantity of developing-country exports projected to the year 2000

Commodity	Scenario I		Scenario II	
	Quantity	Annual Growth Rate	Quantity	Annual Growth Rate
	(1,000 metric tons)	(percent)	(1,000 metric tons)	(percent)
Fruits	19,713	1.73	24,380	3.09
Vegetables	8,154	1.30	12.289	3.93
Vegetables, excluding potatoes	7,445	1.54	10,852	3.96
Total fruits and vegetables	27,867	1.60	36,669	3.36

Source: Calculated from data in Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988.
Notes: It is assumed that world imports equal world exports. In Scenario I, a constant ratio of imports to demand in 1984 is used for projections. In Scenario II, trend functions are estimated to obtain the projected ratio of imports to aggregate demand in the year 2000.

from US$11.7 billion to US$15.4 billion in 1984 values, compared with an average value of exports of US$9 billion during the period 1983-85 (Table 29). Under the second scenario, however, the share of vegetables in total horticultural exports will rise substantially. The share of fruits in the total value of developing-country exports will be between 68 and 72 percent.

These projections of the value of the horticultural exports of developing countries are based on a constant share of developing countries in the volume of world trade of horticultural products and the unit price of exports during 1983-85. There is no significant trend in the share of developing countries in the volume of world trade in either fresh or processed horticultural products. The share of developing countries in the volume of world trade, however, varied between 32 and 42 percent during the period 1961-85.

Over the years the share of developing countries in the value—as distinguished from the volume—of world horticultural trade has increased, although the increase has only been significant during 1975-85. Developing countries' share of the value of world trade of processed horticultural products climbed consistently during 1961-85. But their share in the value of world trade in fresh products fluctuated; it declined during 1968-75 and then rose quickly, though never regaining the share held in 1968.

Therefore, the assumption that the share of developing countries in the volume of world trade will be constant is based on extrapolation of the past trend. Export promotion

Table 29—Value of developing-country exports projected to the year 2000

Commodity	Scenario I		Scenario II	
	Value	Annual Growth Rate	Value	Annual Growth Rate
	(US$ billion 1984)	(percent)	(US$ billion 1984)	(percent)
Fruits	8.5	1.73	10.5	3.09
Vegetables	3.3	1.30	4.9	3.93
Total fruits and vegetables	11.7	1.60	15.4	3.36

Sources: Calculated from data in Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988.
Notes: In Scenario I, a constant ratio of imports to demand in 1984 is used for projections. In Scenario II, trend functions are estimated to obtain the projected ratio of imports to aggregate demand in the year 2000. It is assumed that world imports equal world exports.

by developing countries could increase their share of the volume of world trade, but no assumption is made about this possibility or about the size of such an increase, and hence it is not incorporated into the analysis.

Assuming a constant unit value for exports may, however, not be plausible. If the share of processed products in the total volume of horticultural exports rises as it has over the past 25 years, the unit value of total horticultural exports will go up in the coming years. This is because the unit value of processed products is higher than that of fresh products. The assumption of constant unit value, therefore, may be modified to take account of the changing composition of horticultural exports. Based on past trends, the share of processed products in the total volume of horticultural exports is assumed to increase from 25 percent in 1983-85 to 31 percent in 2000.

With a higher proportion of processed products in total horticultural exports, their unit value would increase, with a consequential increase in earnings to US$13-17 billion, about 6-8 percent higher than earlier estimates.

Projections of Net Exports

The foregoing projections of developing-country exports are given in gross exports. The net trade of developing countries will be less. Since world trade is assumed to be balanced, net exports of developing countries are equal to net imports of developed countries. Net exports of developing countries are given in Table 30.

Net exports of developing countries in 1984 were about 11.8 million tons, 10.6 million tons of fruits and 1.2 million tons of vegetables. Thus, in the scenario based on a constant share of imports in aggregate demand, little change is projected in net trade, even though both gross imports and exports are projected to expand significantly. Surprisingly, under this assumption, developing countries will change to net importers of vegetables in the year 2000. However, if the share of imports in aggregate demand increases, developing countries will remain net exporters of vegetables, and their net export of fruits will increase by more than 28 percent over the base year by 2000.

Imbalance Between World Imports and World Exports: Future Price Trends

A question may, however, be raised concerning the underlying assumption that world exports will expand to match the increase in world imports, so that no change will take place in prices in the future. An independent projection of exports may not end up with the same quantity of imports, and this may require a change in prices to bring world supply and demand into balance (Table 31).

If exports grow at trend rates through 2000, the growth rates projected for the world horticultural exports—fruits, 2.04 percent; vegetables, 3.91 percent; and total fruits and vegetables, 2.75 percent—will be less than the growth rates projected for imports on the basis of growth in income and population and a rise in the import ratio.

The nominal unit values of horticultural exports for the world as a whole and for developing countries enjoyed an upward trend during the period 1965-80, and then began to decline. These trends also hold true when fruits and vegetables are looked at separately (Figure 3). Whether the period 1965-85 is taken as a whole or is split into two subperiods, 1965-75 and 1975-85, the nominal unit values of both fruits and vegetables exhibited a rising trend over the whole period, though the rate of increase slowed during the second period.

Table 30—Projected net exports of horticultural projects of developing countries in the year 2000

Commodity	Scenario I		Scenario II	
	Net Exports	Growth Rate	Net Exports	Growth Rate
	(1,000 metric tons)	(percent)	(1,000 metric tons)	(percent)
Fruits	12,061	0.80	15,504	2.39
Vegetables	-1,439	. . .	1,097	1.86
Vegetables, excluding potatoes	175	-11.60	903	-2.00
Total fruits and vegetables	10,622	-0.46	16,601	2.35

Source: Calculated from data in Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988.
Notes: In Scenario I, a constant ratio of imports to demand in 1984 is used for projections. In Scenario II, trend functions are estimated to obtain the projected ratio of imports to aggregate demand in the year 2000.

As far as real unit values are concerned, there was no strong trend in the real price of either fruits or vegetables in the aggregate for the period as a whole (Figure 4). However, in examining the most recent period, 1975-85, a downward trend in the real price of vegetables is discernible—an indication of a high rate of growth of supply in relation to the rate of growth of demand. Data indicate no trend at all for fresh or processed vegetables or for processed fruits. Only for fresh fruits was there a slight downward trend.

At the same time, it should be noted that horticultural products fared better over the long haul than the other main groups of food and agricultural products. There were significant downward trends in the real prices of cereals, fats and oils, and agricultural raw materials during the period 1961-85. There was no significant trend in the real price of beverages. However, during the latter decade, 1975-85, with the exception of the downward trend in cereals, there were no significant trends in the real prices of other commodities.

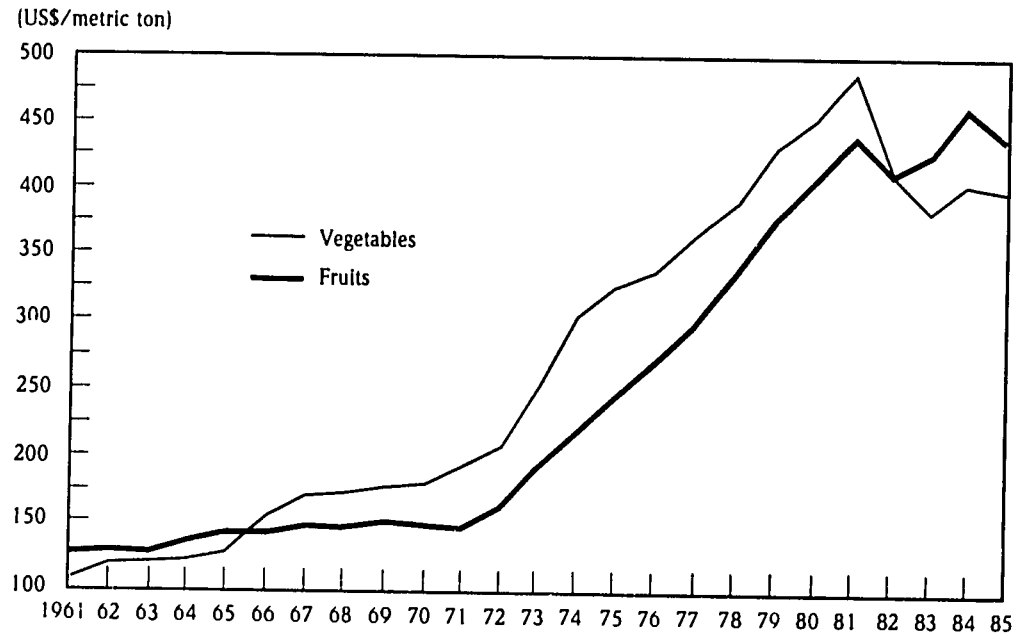
The 1975-85 downward trend in the real unit value of vegetable exports occurred during a period when there was substantial acceleration in the rate of growth of exports, not only compared with earlier years but also with fruits. Competition in world trade of vegetable products was intense, leading to fluctuations in the shares of the individual

Table 31—Imbalance between projected world imports and exports of horticultural products

Commodity	Import Projection		Export Projection	
	Quantity	Growth Rate	Quantity	Growth Rate
	(1,000 metric tons)	(percent)	(1,000 metric tons)	(percent)
Fruits	50,976	3.09	42,792	2.04
Vegetables	44,507	3.93	42,968	3.91
Vegetables, excluding potatoes	34,568	3.96	35,355	4.36
Total fruits and vegetables	95,483	3.36	85,760	2.75

Source: Calculated from data in Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988.

Figure 3—Unit prices of developing-country fruit and vegetable exports, 1961-85



Source: Based on data compiled by the author from various FAO sources.

exporters. A few countries lost shares and others gained. Cost-reducing innovations may also have contributed to this phenomenon.

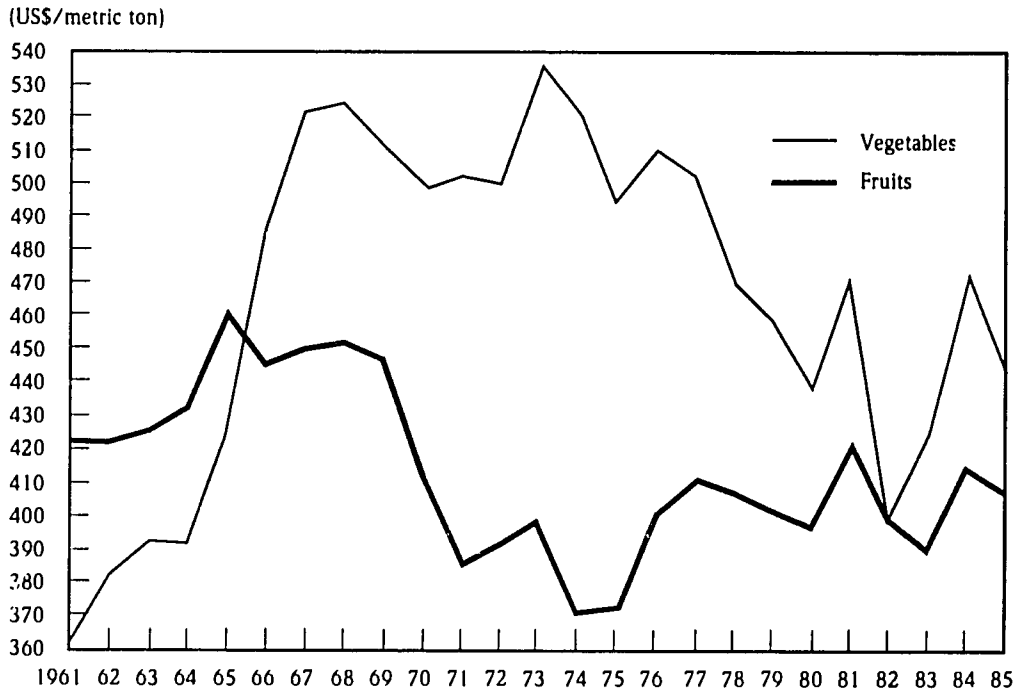
What are the prospects for price developments in horticultural exports? As indicated above, import demand is projected to exceed export supply by 2000, with the result that there is likely to be upward pressure on export prices, especially for fruits. A balance between supply and demand will require either an increase in supply or a reduction in demand.

Sources of Future Growth

Of the two factors that have driven the expansion of horticultural exports from developing countries in the past—the increase in world import demand and the increase in the developing countries' share of world exports—it was the increase in world import demand that was the predominant engine of growth. This was due more to a rise in the share of imports in aggregate demand than to an increase in aggregate demand as such. In fact, if the share of imports in total consumption continues to rise at the trend rate, as is projected, the share of imports in aggregate demand will increase from 18 to 23 percent for fruits and from 4 to 7 percent for vegetables.

If the share of imports in aggregate consumption is unchanged, the volume of exports is projected to go up by about 33 percent, from US$9 billion to US$12 billion. If the share of imports continues to grow at the past rate until 2000, exports are expected to increase by about 70 percent, reaching US$15 billion.

Figure 4—Real prices of developing-country fruit and vegetable exports, 1961-85



Source: Based on data compiled by the author from various FAO sources; and World Bank, *Commodity Trade and Price Trends* (Washington, D.C.: World Bank, 1988).
Note: Export unit values are deflated by the manufacturing unit value c.i.f. index.

What is likely to be the main driving force behind the expansion of exports in the future? It is unlikely that aggregate demand in developed countries is going to grow fast. The major source of growth in aggregate demand will be in the developing countries and in the centrally planned economies. But import demand in developing countries will rise only as the result of a substantial acceleration in their overall economic growth, combined with liberalization of their import trade. Even then, the share of the total world import demand held by developing countries will be quite low. In view of the large domestic market, the expansion of import trade in developed countries and in the centrally planned economies holds the key to the future expansion of exports from developing countries, at least in the medium term.

At the same time, the developing countries must strive to increase their share in world horticultural trade. In fact, a greater emphasis than in the past needs to be placed on this source of growth. In strengthening the competitive advantage of developing countries in world horticultural trade, the development of infrastructure and cost-reducing technological innovations play an important role. In the drive to increase their share of the world market, the developing countries should emphasize the intradeveloping-country trade and markets in the centrally planned economies, as well as developed-country markets.

It may be recalled that the earlier estimate of the increase in exports of developing countries was based upon an increase in income of about 5 percent a year and an

unchanging share of developing countries in world trade (Table 32). If the world economy recovered quickly and the rate of growth of developing countries increased to 7 percent, the increase in their exports would still be no more than US$1 billion annually, largely because their share in total world imports and consequently the absolute volume of imports, remain low. It is arguable that in the years to come, developing countries can increase their share of world trade, at least by increasing trade among themselves. The developing countries now obtain about 51 percent of their imports from other developing countries. If an increase to 70 percent is assumed, developing countries would supply an increasing share of the total imports of developing countries; their exports would increase by about US$7-9 million annually.

As for the developed countries, the slow growth of import demand in the centrally planned Eastern European countries in the past contrasts markedly with the rest of the world. The rate of growth in aggregate demand in Eastern Europe was even higher than that in Western Europe. But the high growth rate in domestic demand was met by a corresponding increase in domestic production, so that import demand continued to stagnate. For example, between 1970-72 and 1983-85, aggregate demand increased by 45 percent, but imports did not increase at all, resulting in a fall in the import demand ratio.

A high rate of growth in aggregate demand is likely in the future because current per capita consumption is low (Table 33). Per capita consumption of vegetables in the centrally planned economies is higher than that in most developed market economies. However, per capita consumption of fruits is markedly lower. Fruit consumption in the U.S.S.R. is even less than in the rest of Eastern Europe. Insofar as fruits other than bananas and citrus fruits are concerned, per capita consumption in the U.S.S.R. and Eastern Europe is still lower than that of Western Europe or North America; however, it is higher than that of Japan. The most significant differences between the U.S.S.R. and Eastern Europe, on the one hand, and the developed market economies, on the other, lies in consumption of bananas and citrus fruits. Per capita consumption of these two categories of fruits is only 11 and 14 percent, respectively, of the per capita consumption in the developed market economy countries. Eastern Europe, including the U.S.S.R., has severely restricted import demand for noncompeting products like bananas and citrus fruits, which are not domestically produced. If per capita consumption is allowed to increase by 2 kilograms per capita, this alone would create an additional import demand of about 1.6 million tons, which is about 39 percent of horticultural imports during 1983-85.

Table 32—Value of developing-country exports projected to the year 2000 under different assumptions

Share of Intra-Developing-Country Imports in Total Imports	Annual Income Growth Rate			
	4.9 Percent		7.0 Percent	
	Scenario I	Scenario II	Scenario I	Scenario II
	(US$ billion)			
51 percent	11.7	15.4	12.7	16.4
70 percent	12.4	16.3	13.4	17.3

Source: Calculated from data in Food and Agriculture Organization of the United Nations, "Agriculture: Toward 2000 Data Tape," Rome, 1988.

Notes: In Scenario I, a constant ratio of imports to demand in 1984 is used for projections. In Scenario II, trend functions are estimated to obtain the projected ratio of imports to aggregate demand in the year 2000.

Table 33—Per capita consumption of fruits and vegetables in developed countries, 1983-85

Country/Region	Fruits					Vegetables			
	Total	Oranges	Other Citrus Fruits	Bananas	Other Fruits	Total	Total Minus Potatoes	Potatoes	Pulses
	(kilograms/capita/year)								
North America	123.4	48.8	6.8	10.1	57.7	169.8	108.5	61.3	2.6
United States	151.4	76.2	9.0	9.8	56.4	163.2	109.7	53.5	2.5
Canada	95.3	21.4	4.6	10.5	58.8	176.1	107.1	69.0	2.6
Western Europe	101.6	19.1	4.0	6.5	72.0	181.1	101.8	79.3	2.5
Federal Republic of Germany	116.3	13.5	3.8	7.5	91.5	148.4	74.3	74.1	1.1
France	79.4	16.3	4.4	7.6	51.1	192.3	117.3	75.0	1.9
Italy	131.1	30.3	9.6	4.9	86.3	220.6	178.7	41.9	3.7
United Kingdom	56.0	10.0	2.8	5.4	37.8	180.2	79.2	101.0	3.0
Sweden	76.1	15.9	2.1	8.3	49.8	123.3	52.5	70.8	0.4
Switzerland	139.8	15.5	5.3	8.7	110.3	130.7	82.8	47.9	1.6
Japan	63.2	21.3	4.7	4.6	32.6	140.9	113.9	27.0	2.4
Oceania	83.6	17.7	3.2	6.1	56.6	134.1	80.3	53.8	1.7
Eastern Europe	64.3	3.0	2.5	1.0	57.8	187.6	105.0	82.6	2.9
U.S.S.R.	45.2	2.5	0.8	0.5	41.4	213.6	104.7	108.9	2.8

Source: Food and Agriculture Organization of the United Nations, "Food Balance Sheets," Rome, various years, computer printout.

If the future rates of growth in income and population in Eastern Europe and the U.S.S.R. are as indicated in Table 25, the rate of growth in demand for fruits is projected to be much higher—about 2.8 percent—than that for vegetables—1.8 percent. To what extent this will lead to an increase in imports will depend upon the import policy of this region, that is, whether growth in demand will be met by increased domestic production of the kinds of fruits and vegetables demanded, or whether the consumption pattern will be allowed to diversify through an increase in noncompeting imports, such as bananas, citrus fruits, and other tropical fruits and vegetables.

7

SOME POLICY ISSUES AND QUESTIONS FOR FUTURE RESEARCH

The foregoing analysis of the past trends and salient characteristics of horticultural exports of developing countries, including growth, composition, and geographical destination, was primarily based on aggregate data—historical time series and cross-section data. The results of this analysis raise a number of issues and questions that require more detailed examination of the experiences of individual countries. It is hoped that this will throw further light on past experiences and also help formulate an appropriate strategy for production and export marketing of horticultural products in developing countries.

The issues that require further examination relate not only to the production, domestic marketing, and distribution systems, but also to the organization of and techniques for export marketing, including the provision of export market intelligence, credit, and appropriate shipping and transportation facilities. The basic thrust of this examination is to explore whether the labor-abundant and increasingly land-scarce developing countries already have or can develop comparative advantage in the production and export of horticultural products, and if so, to what extent. Past experience indicates that many developing countries have done well promoting horticultural exports, but others with similar or comparable resource endowments have not done so well.

A number of questions seem relevant in this context. How labor-intensive are horticultural products? Is there a wide variation among horticultural products in labor intensity? Are they particularly suitable or appropriate for small farmers? Are there economies of scale that require large-scale production of horticultural products for export? Again, in countries that have successfully increased horticultural exports, do larger farmers tend to dominate export production? Is horticultural production a way of diversifying or expanding the sources of farmers' output and income?

Increases in horticultural production and exports are often the result of a search for agricultural diversification in response to rising costs of and diminishing returns from the production of traditional crops, partly because a plateau has already been reached in the growth of productivity and partly because the growth of demand has slowed. Does a successful export performance require that producers specialize in the production of horticultural crops? Or do producers who undertake a system of mixed farming—who produce other crops in combination with horticultural crops—do as well? How far is an increase in horticultural production initiated or stimulated exclusively by export demand? In the past, cultivation of many of the traditional export crops, such as cotton, sugar, tobacco, coffee, and tea, was often undertaken predominantly in response to import demand in industrial countries. Does export-led growth of the horticultural sector run the risk of an uncertain future because it is linked to the volatile export market? In countries that have done well in horticultural exports, does a large domestic market for such crops contribute to their success?

Even if the production of horticultural crops is labor-intensive and efficiently produced by small farmers, are there significant economies of scale in their distribution, marketing, and processing? Similarly, while the production of horticultural crops themselves may be labor-intensive, does their marketing and distribution (including handling, transportation, grading, standardization, and quality control) require considerable skill,

capital, and organization? How important are good communication and transportation links to the rest of the world in establishing close and constant contact between exporters and importers in view of the perishability of the product, the volatile nature of the market, and frequent changes in consumers' taste?

Labor Intensity of Horticultural Products

There is some evidence in both developed and developing countries that horticultural products are generally labor-intensive. For example, in California, United States, labor intensity in labor hours per acre varies from 1,300 hours for strawberries, 420 hours for tomatoes, 40 hours for walnuts, and 12 hours for sorghum, corn, and rice to 5 hours for wheat and barley. In Kenya, labor intensity for vegetables is 3 times higher than that for maize and 10 times higher than that for wheat, although it is not much higher than that for tea and coffee. In Guatemala, vegetables are about 3 times more labor-intensive than maize or barley.[35] The degree of labor intensity varies among individual fruits and vegetables and from country to country. The differences in labor intensity of the same crop in different countries—tomatoes, for example—in labor input per hectare and the quantity of tomatoes produced is shown in Table 34.

Similarly, the ratio of labor costs to production costs varies among countries for the same commodities (Table 35). In three countries—Jamaica, Mexico, and the United States—and for both cucumbers and peppers, the share of labor in total production costs is high. For cucumbers, shares of labor cost in production cost are the same in Florida and Mexico, but both labor and production costs are much higher in the United States than in Mexico. The ranking of the countries in labor costs seems to determine their ranking in total production costs as well.

In several instances, production techniques also have been adjusted to the relative availability or scarcity of different factors in various countries. For example, in developed countries, attempts are made to use capital-intensive technologies to offset the scarcity and high costs of labor.

The introduction of mechanical harvesting of vegetables is a case in point. Mechanical tomato harvesting, for example, has reduced the advantages of countries or regions with low labor costs.[36] Fruits are less amenable to mechanical harvesting and more suitable for labor-intensive harvesting methods such as picking. On the whole, attempts at mechanization have not been very successful for fruits and vegetables. Even at the high wage rates prevailing in developed countries, it is frequently unprofitable to replace labor with machines in many operations.

Breakthroughs in the mechanization of horticultural production have occurred in operations such as weed control and transplanting, as well as harvesting, but they are

[35] See Moulton et al. 1986 for U.S. figures, Jaffee 1986 for Kenyan, and von Braun, Hotchkiss, and Immink 1989 for Guatemalan.

[36] The mechanical tomato harvester requires large, uniform tomatoes, which led to the breeding of "hard" tomatoes for the harvester. It increased the advantage of large-scale irrigated farms over small, rainfed farms. Biological innovations in tomato breeding, which were associated with the introduction of mechanical harvesting in California, produced tomatoes with characteristics suitable for growing in countries with inadequate infrastructure, soils, or climate, such as very hot climates. The hard tomatoes could be transported over long distances on rough roads and loaded on trucks without breaking or spoiling. Technical innovations thus reduce the built in agroecological advantages of specific countries or regions by widening the range of conditions under which a particular horticultural product can be grown (Moulton et al. 1986, 6).

Table 34—Labor inputs and yields per hectare for tomatoes in different countries

Country	Yield per Hectare	Labor Input
	(metric tons)	(hours/hectare/year)
Florida, United States	31	1,000
Mexico	19	2,000
Taiwan	24	8,000
Thailand	16	3,500

Sources: Florida and Mexico data: Katherine C. Buckley et al., *Florida and Mexico Competition for the Winter Fresh Vegetable Market*, Economic Research Service Report 556 (Washington, D.C.: U.S. Department of Agriculture, 1986). Taiwan data: Ruben L. Villareal, *Tomatoes in the Tropics* (Boulder, Colo., U.S.A.: Westview Press, 1980), pp. 4 and 23. Thailand data: Merle R. Menegay, "Improving the Performance of Procurement Systems for Fruit and Vegetable Processors in Thailand: A Case Study of Up-Country Pickers and Canneries," Ph.D. dissertation, Michigan State University, Ann Arbor, Mich., U.S.A., 1985, p. 329.

limited to a few crops. The processes that have been mechanized are relatively simple ones. Crops such as berries have proved difficult, leading to caution in predicting the success of mechanization in the future.

Several factors discourage mechanization. First, it has an adverse effect on quality. Mechanical pickers often bruise products, losing a substantial part of the harvest. At the wages prevailing in the United States, for example, the value of lost fruit is more than the cost of labor engaged to avoid the loss. Second, mechanical pickers cannot pick fruit selectively based on maturity; they make a single harvesting pass through the field. A successful harvester for fresh strawberries, for example, is unlikely, because fruit matures unevenly and the plants are very delicate. The same is true for lettuce, citrus fruits, and melons (Daines and Hargreaves 1985, 15-19).

The disadvantage of high labor cost in developed countries can be offset by the development of higher-yielding varieties (HYVs) through technological research, so that low labor cost no longer provides a competitive edge. This has been the case with strawberries in Mexico, where small farmers grow a low-yielding variety. Over time, California considerably increased its output per hectare through the development of an HYV, a more appropriate rotation of land, and better control of pests and diseases, thus

Table 35—Comparative production costs of cucumbers and peppers in Florida, Jamaica, and Mexico, 1983-85

Cost	Cucumbers			Peppers		
	Florida, United States	Jamaica	Mexico	Florida, United States	Jamaica	Mexico
Total production cost per bushel (US$)	8.56	6.35	3.92	6.29	5.55	4.06
Labor cost per bushel (US$)	4.05	2.74	1.86	2.65	2.37	1.38
Ratio of labor cost to production cost (percent)	47	43	47	42	43	34

Source: Mark A. Peters, "An Analysis of the Economic Potential for Export Vegetable Production in Jamaica," M. S. thesis, University of Florida, Gainesville, Fla., U.S.A., 1987, pp. 89-91.

offsetting the disadvantage of high labor costs. Broccoli, however, is produced in Mexico under contract with U.S. firms that operate freezing plants located in Mexico: Mexican growers benefit from U.S. technological innovations and varietal improvements (Moulton and Runsten 1986). Thus, yields are comparable in Mexico and the United States, but low labor costs confer on Mexico a comparative advantage, not only in the production of broccoli (Mexican wage cost being one-third of the U.S. wage cost) but also in the freezing industry (Mexican wages being less than one-tenth of American wages). The low labor cost is especially advantageous for Mexico because transplanting techniques for broccoli are highly labor-intensive, and the United States has not succeeded in devising a mechanical technique for transplanting.

Horticultural products usually require more working capital than other crops because they use more current inputs like fertilizer and pesticides. In Guatemala, for example, the input costs per hectare are 13 times higher for snow peas than for maize (von Braun, Hotchkiss, and Immink 1989). Furthermore, input costs relative to labor costs are much higher for vegetables than for cereals. The value of current inputs relative to wage costs is 300 percent higher for snow peas and 30-50 percent higher for traditional vegetables, broccoli, and cauliflower.

Scale Economies in Horticultural Production

In a few countries, the entry into export markets for horticultural products was based in the initial years on the production of large farms, but eventually production for the export market spread to small farms. In a number of these countries, production of horticultural products for the export market was initiated by foreign settlers—by the British and Asian settlers in Kenya, for example, or the French settlers in Côte d'Ivoire, who happened to be the large farmers. Foreign-owned exporting firms combined production with processing and marketing and found it easier to manage large plantations. Finally, the exporting firms that resorted to contract farming found it easier to deal with a limited number of large farmers than with numerous small farmers scattered over a wide region.

In the course of time, however, production of export crops did spread to small farmers, either because contractors found ways of dealing effectively with small farmers or because the prices at which they could obtain supplies from small farmers were lower, or because the amount of production available from large farmers was inadequate, and additional supplies could only be obtained by extending production to the small farmers.[37] As a result, the bulk of production of fruits and vegetables for the export market in Kenya and Côte d'Ivoire is supplied by small farmers.

That supplies are obtained from small farmers at a lower price than that paid to large farmers is, in some cases, attributed to the weaker bargaining power of small farmers vis-à-vis the processing plants and contractors or the traders. Small farmers are often willing to accept an income for their family labor that is less than the wage cost of hired labor.

Sometimes historical and institutional circumstances confer advantages on small farmers. This has been the case, for example, in Senegal. The region of the country that is agro-ecologically suitable for growing horticultural products has a land tenure

[37] The comparative advantage of small farmers in horticultural products in Guatemala was due not only to high labor intensity and low opportunity cost of family labor but also to careful field management and supervision required to meet quality standards (von Braun, Hotchkiss, and Immink 1989, 29).

system that gives small farmers an advantage. Small farmers who settled in the region a long time ago had usufruct rights to the land. Plots that became available later on for new farmers were not large enough for mechanized and large-scale farming. Also, small farmers water their land using labor-intensive techniques at a lower cost, whereas the large-scale farmers are obliged to use diesel pumping of metered wells (Horton 1987). In Senegal, small farmers produce 60 percent of horticultural exports; medium farmers, owning 1-5 hectares, account for 17 percent, and the rest is produced on large-scale estate farms (Horton 1987, 18).

In Guatemala, the production by small farmers of nontraditional vegetables destined for export marketing in the United States and Western Europe was initiated and stimulated by international development assistance agencies (von Braun, Hotchkiss, and Immink 1989). They provided financial assistance to a private company to open up export channels. At the same time, they helped organize a cooperative of small farmers to grow nontraditional vegetables and to gain access to export outlets through the private company. A foreign private company, a subsidiary of a U.S. company, provided know-how and related infrastructure, such as cold storage. Guatemalan public agencies also provided credit and technical know-how to the farmers' cooperative, including assistance for the development of vegetable processing equipment. The cooperative provided a wide range of services ranging from extension and education at the farm level to the supply of inputs, collection of produce from individual farmers, selection and grading of export products, and storage. Under a contractual arrangement with a foreign export company, it was able to obtain assured access to export markets. Eventually, the cooperative began to export independent of the foreign export company through alternative marketing channels.

Yet scattered evidence from countries such as Kenya and Senegal indicates that not all export commodities are suitable for smallholder contract farming. The need for closer control over or supervision of the production processes in order to ensure the standardized quality and volume required in export markets favors large-scale estate farming. Where exporters control and manage large-scale estate farms, they are often able to introduce new crops and to make improvements faster through ongoing evaluation of the yields of current varieties or cultivation practices. In the initial years, the contract farming system based on small farmers is sometimes cumbersome in introducing innovations. Once the new crops or practices are widely known, contract farming by small farmers is usually profitable. In Kenya, for example, Kenya Canneries, Ltd. (a Del Monte subsidiary) did not find it profitable in the early stages to undertake production of pineapples on the basis of a contract with small farmers; instead, the company decided to grow fresh pineapples on its own estate farms. In Kenya, fruits such as pineapples and avocados are mostly produced by large farmers, whereas vegetables are grown by both large and small farmers (Jaffee 1986).

Large farmers often have two advantages. First, their bargaining position vis-à-vis exporters is strong; they can provide large quantities of uniform batches of products on a continuous basis. Second, they are able to diversify their production, combining horticultural crops with export crops such as coffee or with noncrop activities such as cattle breeding, as is the case in Kenya (Hörmann 1981, 31-52).

In Côte d'Ivoire, the producers' cooperative, COFRUITEL, which is composed of large farmers, dominates the production of horticultural products for export, particularly pineapples and bananas. It not only supervises and coordinates its members' production, but it also assists them in procuring inputs and credit and arranging international transportation and marketing of products, including the provision of phytosanitary services. Whereas the production of fresh pineapples for export is dominated by the

large enterprises, the production of pineapples for supply to the domestic processing industry (the output of which is also partly exported) is undertaken by small farmers, organized in various cooperatives of their own (Hörmann and Wietor 1980, 21-28). The large farmers in Côte d'Ivoire have mechanized a number of operations, excluding sowing and planting; for example, they have replaced labor with herbicides and use mounted sprayers for pesticides.

In Kenya, horticultural products are produced on a wide range of farm sizes. First, there are the large-scale estates, averaging 100 acres or more, with large investments in irrigation and heavy use of inputs, hired labor, and skilled management. These large estates often cultivate traditional export crops such as coffee and sisal. Second, there are the medium-size farmers with 10-50 acres who mostly produce fruits, and those with 8-30 acres who mostly produce vegetables. They work predominantly on unirrigated lands. Third, there are the smallholders with access to inputs and water. Those with 6-20 acres may produce other cash crops; those with only 2-5 acres only produce horticultural crops for export. Fourth, there are the small farmers on rainfed land with meager access to inputs and water, who produce horticultural crops and foodcrops exclusively. Out of their total farmland of less than 6 acres, they devote about 1 acre to horticultural products and the rest to subsistence crops; they do not produce other cash crops. The participation of these various farm types in horticultural production for export markets is shown in Table 36.

Insofar as the importance of economies of scale in the cultivation of horticultural crops is concerned, the evidence so far is inadequate and inconclusive. Furthermore, there are differences between horticultural products in this regard. Empirical evidence on yields per hectare or costs per unit of output from farms of different sizes is difficult to come by. In the Philippines, Hayami, Adriano, and Quisumbing (1988) show that yields from plantations and small farms are comparable for both bananas and pineapples. In Kenya, Hörmann (1981) finds that small farmers raising French beans spent 36 percent of production costs on inputs and 64 percent on wages, whereas large farmers spent 54 percent on inputs and 46 percent on wages; their total production costs per hectare were quite similar, however. These examples do not indicate the presence of any significant economies of scale in the production of bananas and pineapples in the Philippines or of French beans in Kenya. And, in Guatemala, gross margins per hectare for individual crops did not vary in any systematic way with variation in the sizes of farms

Table 36—Percentage of export-oriented production in different types of farms, Kenya, 1985

Crop	Large Estates	Medium-Size Farms	Smallholdings	
			Well-Endowed	Not Well-Endowed
Pineapple	100	...	...	...
Strawberry	100	...	...	...
Passion fruit	30	15	35	20
Avocado	20	25	30	25
Asian vegetables	10	35	25	30
Mango	0	35	20	45
Fresh beans	10	40	30	20
Processed beans	0	5	5	90

Source: Steven Jaffee, "The Kenyan Horticultural Export Sector: An Economic and Institutional Analysis of Alternative Marketing Channels," final report to the U.S. Agency for International Development, St. Anthony's College, Oxford University, Oxford, 1987.

(von Braun, Hotchkiss, and Immink 1989, 44). For traditional vegetables and snow peas, the smallest farms—those between 0.25 and 0.50 hectare—had the highest gross margins per hectare, but the next size group (0.50-1.00 hectare) had lower gross margins than the largest farm-size group, those with 1 hectare or more. For broccoli and cauliflower, the farms between 0.50 and 1.00 hectare had the highest gross margins per hectare, while gross margins for the largest farms—1.00 hectare and more—declined slightly.

In another case study in Kenya, Shapiro and Wainana (1987, 18-20) found that the minimum efficient farm size varied from crop to crop. For example, cashew nuts, pineapples, macadamia nuts, and citrus fruits required more land than other horticultural products, implying that on farms that are smaller than the minimum for efficient production, the unit costs of production are higher. The study finds that vegetables are more labor-intensive than fruits and nuts; the labor requirements for vegetables are estimated to be two man-years per hectare as against two-thirds of a man-year for fruits and one-twelfth of a man-year for nuts.

Thus the presence of significant economies of scale in horticultural production seems unlikely, based on evidence so far. A few agricultural operations may yield economies of scale—the control of pests and diseases or the use of tractors for land preparation or irrigation facilities, for instance, but it is possible to devise institutional arrangements that enable small farmers to realize the scale economies of these specific operations.[38] Insofar as marketing, distribution, transportation, and processing of horticultural products are concerned, however, there are economies of scale.[39]

Economies of scale are prevalent in storage and transportation operations. Marketing costs are high for fresh products because they may require refrigerated facilities in transit, at collecting points in the producing regions, and at the point of shipment by sea or air. A substantial fixed investment in such facilities may yield economies of scale. Close coordination of production, processing, and marketing in order to meet the quality requirements of export markets leads to economies of scale; such coordination is more easily accomplished when large quantities are marketed or processed. For example, a boatful of bananas that meet all quality standards must be collected within a few days. The whole chain of activities from production to marketing or distribution needs to be precisely scheduled and controlled. Transaction costs can be reduced by dealing with large shipments and by spreading overhead costs of labeling, packing, and sorting over a large quantity. To secure access to a regular shipping service, countries need to have a sufficient volume of trade to attract shipping lines to call at their ports.

Transportation and Export Marketing of Horticultural Products: Some General Issues

The share of transport and marketing costs in the total cost or sale price of horticultural products is high, as can be seen from the costs of exporting vegetables from

[38] The incidence of pest outbreaks and contagious diseases increases if the same plant species is grown over a wide area. Hence the uniform specification of strict pest and disease control measures over an entire area is essential for maintaining quality and ensuring adequate output. Cooperative or joint arrangements are therefore needed by small farmers for efficient control and management of pest and diseases.

[39] The marketing and distribution of horticultural products often require skill and organization, including specialized equipment for transporting perishable commodities. Many countries airfreight horticultural products rather than shipping them by sea. In Kenya, passenger airlines passing through Nairobi are obligated to allocate cargo space for Kenyan horticultural products, and concessional freight rates are negotiated by the government with the airlines.

Mexico to the U.S. market (Table 37). These costs, which include production, internal and external marketing, distribution, and transportation costs to the point of entry into the United States (excluding the profit margins of importers, wholesalers, and retailers), averaged about 50 percent; in some extreme cases, they were as high as 70 percent. For airfreighted products from Guatemala to the United States, the international transport and marketing costs constituted a much higher percentage of total costs—42 percent.

International transport costs play an important role in determining the competitiveness of horticultural exports in the world market. The labor cost advantage of the low-income developing countries can be lost if the share of transport costs in the final sale price of products is too high. In Table 38 the horticultural products of El Salvador are ranked by the value of the crop—the transport feasibility index—and the number of labor hours required per ton. The higher the unit value of the product, the greater is its ability to sustain high transport costs because these costs constitute a small share of a high value product. There is no systematic relationship between the two rankings, even though some products that have high labor intensity also happen to have high unit value, and others that have low labor intensity happen to have low value.

It is important to note that the horticultural products that are sold in the domestic market are often different from those sold in the export market. In Kenya, for example, this is true for vegetables more than for fruits. Even though there is a growing domestic market for many exportable fruits, the varieties of fruits that are sold in export markets are usually different, with the result that the marketing channels are also differentiated. In several cases, the horticultural products for export are "demand driven" by foreign importers rather than "supply driven." New crops that are not consumed or produced at home are introduced in order to meet export demand. Several examples are French beans in Kenya; snow peas, cauliflower, and broccoli in Guatemala; and beans, melons, and peppers in Senegal.

The marketing and distribution systems for horticultural exports are highly diverse, conditioned partly by the historical circumstances of different countries. In some cases, farmers are linked with exporters by the traders who collect and distribute their products in the domestic market, as well as to exporters. In other cases, the production,

Table 37—Shares of cost components in total cost of selected Mexican horticultural exports to the United States, 1984/85

Commodity	Production Costs[a]	Internal Transport and Marketing Costs[b]	International Transport and Handling Costs[c]	Total Costs at Point of Delivery
		(percent)		
Tomatoes	48	29	23	100
Bell peppers	42	38	20	100
Cucumbers	30	36	34	100
Green beans	54	28	18	100
Eggplants	38	30	32	100
Squash	49	22	29	100

Source: Katherine C. Buckley et al., *Florida and Mexico Competition for the Winter Fresh Vegetable Market,* Economic Research Service Report 556 (Washington, D.C.: U.S. Department of Agriculture, 1986).
[a]Production costs include harvesting and packaging.
[b]Internal transport costs are from the farm to the export point.
[c]International transport costs are from the export point to the delivery point in the importing country (New York).

Table 38—Ranking of selected horticultural products in El Salvador by transport feasibility

Commodity	Transport Feasibility[a]	Labor Cost Advantage[b]
	(US$/metric ton)	(hours/metric ton)
Strawberries	2,400	113
Mushrooms	2,000	170
Asparagus	1,500	85
Broccoli	1,200	55
Tomatoes	1,000	60
Cucumbers	750	47
Cauliflower	650	40
Citrus fruits	550	28
Bananas	350	32
Pineapple	300	30

Source: S. Daines and G. Hargreaves, "Fruit and Vegetable Export Possibilities for El Salvador," U.S. Agency for International Development, Washington, D.C., 1985, pp. 5-19 (mimeographed).
[a]The index of transport feasibility is the value of a ton of output. The higher the value, the greater the crop's ability to sustain high transport costs.
[b]Labor cost is the number of labor hours spent per month for producing, harvesting, and packaging a ton of produce.

marketing, and processing of horticultural products are integrated through plantation or contract farming systems based on contracts between producers and exporters, on the one hand, and exporters and importers abroad, on the other. Both foreign and domestic enterprises are engaged in either large-scale estate farming or contract farming or both.

In Côte d'Ivoire, producers have formed a cooperative of their own to market export products. Frequently, exporters are few and marketing intermediaries are many in the chain of distribution within a country; the number of traders declines closer to the final stage of exporting. In Kenya, for example, five firms accounted for 60 percent of total fresh horticultural exports, and nine firms accounted for 85-90 percent in 1985. Four of them produce fruits and vegetables on their own estates; others obtain supplies from contract farmers or through their agents or wholesalers (Jaffee 1986, 15-38).

Since adjustments need to be made at relatively short notice due to changes in demand and in product specifications, there is a need for direct and regular contact with importers abroad. There is intense competition in the horticultural trade among a few exporters, often for the production of specialized products for designated markets. Different countries and regions demand specific qualities, sizes, grades, varieties, and types of a particular commodity. Since there is seldom a costless movement from one quality or grade to another, exporters are often obliged to specialize in particular grades and qualities; close and continuous contact with overseas markets becomes all the more essential. Therefore, contractual arrangements with importers abroad reduce marketing risks and help provide efficient market information. The barriers to entry into export marketing arising from limited access to export market information can be relieved by the government itself providing information. A reputation for reliability, as perceived by overseas importers, can only be acquired over time. A final barrier—command over financial resources in order to be able to take risks—warrants more detailed examination of individual country experiences.

The participation of multinational corporations or foreign direct investment facilitates access to export markets. It is not clear from the existing evidence what is the

best or the most cost-effective method of organizing distribution and marketing systems in the export market. Is the active participation of multinationals or foreign trading companies with direct and established links to distributing and marketing channels abroad essential to successful export marketing, especially in the early stages? In the case of processed horticultural exports, multinational companies dominated in the early stages in Kenya and a few Latin American countries; in the course of time, domestic processors and traders entered the export market. In Kenya in the early 1980s, the five largest processing companies engaged in export marketing had either foreign ownership or expatriate management. Many exported through their affiliated firms abroad (Jaffee 1987, 15-38). Transnational corporations engaged in the production and processing of fruits and vegetables have been involved in both export and local markets. Thirty-three leading firms operating in horticultural exports in developing countries had more than 140 investments in developing countries. In export-oriented activities, the most important operations were in bananas, canned tropical fruits, and fresh produce. In domestic market-oriented activities, the main operations were in canning and dried products (United Nations Centre on Transnational Corporations 1981).

However, the operations of transnational corporations are not widely distributed among a large number of countries in all regions, but tend to be concentrated in a few countries. Latin America has been the largest recipient of investment from transnational corporations in horticultural products. There were 60 operations by various U.S. companies, 29 by European, and 1 by Japanese in the late 1970s, whereas the Pacific and East Asian region had only 14 operations by U.S. companies, 12 by European, and 2 by Japanese. Africa and West Asia had 6 operations by U.S. companies, 24 by European, and 1 by Japanese. Although capital and technological requirements for many of these activities are not significant, the transnational corporations are often the market leaders, with organized export outlets, primarily because of their high degree of efficiency in marketing and promotional activities.

The circumstances under which the processing of horticultural exports shifts from developed to developing countries also needs further analysis. The share of processed products in total horticultural exports of developing countries is on the increase and is expected to rise in the future. Also, in view of the increase in domestic demand in many high-income developing countries, opportunities for a domestic processing industry in these countries are likely to expand in the future. The developed importing countries have a choice between importing fresh products for processing at home or transferring the processing facilities to the developing exporting countries and importing the processed products. The establishment of processing facilities in developing exporting countries rather than in developed importing countries depends among other things on labor costs in relation to the costs of transportation of fresh products from developing countries. Importing fresh products for the purpose of processing them in developed countries is not only expensive because the cost of transportation constitutes a high percentage of the total cost of raw materials, but it also often runs the risk of loss of freshness or deterioration in quality.

Moreover, a shift of processing facilities to developing countries also serves the expanding domestic markets in those countries. The feasibility of processing in developing countries also depends on the level and intensity of tariff and trade restrictions on processed products in the importing countries. Similarly, the extent to which the establishment of processing facilities is encouraged in the developing exporting countries depends on the trade restrictions in developed countries. Both developed and developing countries have tariff structures that escalate with the degree of processing.

Research and Development and Supportive Policies for Exports

Success in export markets requires efficient research, education, and extension services in developing countries. What is needed is an effective link between export markets, on the one hand, and domestic research and extension services, on the other, through the medium of marketing agencies and public or private institutions engaged in the dissemination of export market intelligence. Such a link would facilitate the systematic transmission to farmers of information about the requirements of export markets regarding the desired characteristics and quality of export products.

Research and extension services for horticultural products are often inadequate. There is a wide variety of products, each with a small aggregate value of output or export. At the same time, a critical minimum effort is needed to develop a viable technological package for any crop, however small in value. Therefore, the requirements for technically trained manpower for research, including associated infrastructure, are likely to be large in relation to the value of horticultural output. This suggests the need for careful selection of the products on which research efforts should be concentrated.

Considering that, over time, comparative advantage may shift among countries and that there is intensive competition in the export market, exporters need to be flexible in shifting research expenditures between crops to meet changing market conditions. Associated with the need for adequate research expenditures is the need for production and distribution of an adequate quantity of high-yielding seeds to individual farms, which are small in size but large in number and scattered over long distances.

Table 39 indicates the ratio of horticultural scientists to total crop scientists in selected developing countries relative to the importance of horticultural exports in total agricultural exports. Countries vary widely in their relative emphasis on horticultural research, and the share of horticultural scientists is not correlated with the relative importance of horticultural exports.

It should be noted, however, that the relative number of horticultural scientists among crop scientists is not an accurate indicator of the size and quality of a research effort; the amount of research expenditure and an index of the quality of the researchers are probably better indicators, but this information is seldom available. The lack of a positive relationship between the importance of horticultural exports and of scientists engaged in research on them is probably due to the fact that in most countries the allocation of research expenditures among crops is governed by the domestic output and demand for horticultural products rather than by exports. To increase the allocation of research expenditures to crops such as horticultural crops, which have relatively low priority because of their small share in total agricultural output, would probably require a large increase in total agricultural research expenditures (Schluter 1984, 106-107).

Institutional arrangements for the organization of research and extension services, especially regarding the relative roles of public and private sectors, are different in various countries. Government policy regarding research, infrastructure, education, and training is important. For quality control, grading, standardization, and the control of pests and diseases, the public sector has an important responsibility. In view of the close competition in the export markets for horticultural products, a continuous effort to upgrade quality and to improve disease and pest control measures is crucial. In research, not only the government but also private companies, mostly foreign, must play an important role. Where multinationals or their subsidiaries either participate in production or obtain supplies through contract farmers, they frequently undertake technological research and provide related education and extension services. In Kenya,

Table 39—Share of horticultural scientists in total crop scientists and of horticultural exports in total agricultural exports, selected developing countries, 1983-85

Country/Region	Horticultural Scientists/ Total Crop Scientists	Horticultural Scientists/ Total Crop Scientists, Excluding Root Scientists	Horticultural Exports/Total Agricultural Exports
		(percent)	
Country			
Brazil	13.86	8.17	12
Turkey	47.07	40.96	40
Taiwan	8.10	7.07	n.a.
Mexico	31.75	18.37	31
Philippines	38.69	15.34	26
Chile	18.22	2.54	36
Thailand	11.76	10.42	8
Morocco	36.54	30.13	90
Argentina	25.38	18.04	5
Honduras	45.96	26.09	49
Costa Rica	46.36	13.64	39
India	20.82	2.89	10
Colombia	20.10	13.24	8
Egypt	54.76	44.80	23
Ecuador	48.18	23.36	31
Korea	18.69	18.69	23
Cyprus	21.74	21.74	60
Guatemala	68.52	17.59	15
Côte d'Ivoire	31.54	20.13	5
Panama	28.89	0.00	53
Malaysia	12.49	10.75	2
Kenya	33.33	18.75	11
Jordan	67.05	59.09	51
Iran	28.57	20.17	64
Region			
Asia	19.85	7.48	9
Latin America	32.30	14.35	12
North Africa/ West Asia	45.53	36.90	35
Sub-Saharan Africa	22.35	10.74	7

Source: Basic data compiled by Peter Oram, International Food Policy Research Institute.
Notes: Countries are given in the order of their world market share in 1983-85. Linear correlation between the share of horticultural scientists and the share of horticultural exports was not signi[a] ınt at the 95 percent level.

the Horticultural Crops Development Authority, a government agency, promotes research through government research institutes.[40] In Côte d'Ivoire, the Government Horticultural Research Institute, 50 percent of which is financed by French Technical Assistance, is responsible for research (Hörmann and Wietor 1980, 5-19). Moreover, in Côte d'Ivoire, the government established a separate agency (SUDEFEZ) for undertaking education, extension, and training of horticultural farmers.

[40] The Horticultural Crops Development Authority has, among others, the following functions: (1) promotion of production and marketing of horticultural products through education, extension, and training of farmers; (2) supervision of export products for quality control and packaging; (3) granting of export licenses to exporters; (4) standardization of containers; (5) preshipment inspection at export points for enforcing quality standards; (6) allocation of scarce cargo space among the experts; and (7) provision of market information in cooperation with the International Trade Center in Geneva (Shapiro and Wainana 1987, 8-11).

Furthermore, government may also play a role in providing trade information to importers abroad about sources of supply in exporting countries and to domestic exporters about foreign markets. In some countries, for example, the government agencies undertake an independent analysis of export markets, including competitors' prices and availability of supplies. They also promote or arrange for the participation of exporters in foreign trade missions, fairs, and exhibitions.

Successful export-oriented countries, such as Hong Kong, Korea, Singapore, and Taiwan, have demonstrated that, within the framework of efficient macroeconomic and sector-specific policies, trade promotion measures such as information services; effective participation in trade fairs and missions; external publicity, market analysis, and development; and assistance to export firms in product design, packaging, and marketing are important (Keesing 1988, 2).

Success in production and marketing of horticultural products in world markets also depends on economy-wide exchange rate and trade policies. Policies regarding the import of inputs—both intermediate inputs and capital equipment for processing operations—are often important: liberal access to imported inputs is more often than not a key component of export-oriented trade policy (Keesing 1988, 5).

Although the foregoing analysis touches on a number of issues that are important for the future growth of horticultural exports from developing countries, the evidence presented, based on secondary data, is incomplete. More detailed country-specific empirical investigations are needed to provide a more informed basis for the formulation of an appropriate strategy for this sector.

8

CONCLUSIONS

Horticultural products are growing in importance in world agricultural trade and in developing countries' agricultural exports. Developing countries have increased their share of world horticultural trade over the years, with fruits constituting a large proportion of their total horticultural exports. Although the nominal unit value of horticultural exports has increased over time, the real value has not shown an upward trend. Trade in individual commodities has been concentrated in a few exporting countries; the top four exporters accounted for 80-100 percent of total exports in many commodities. The European Community, the United States, and Japan have been the most important markets for these exports, with imports growing fastest in recent years in the United States and Japan.

Most of the horticultural trade, however, is carried on between the developed countries themselves, acting as both exporters and importers. Tropical horticultural products are the exception. Most horticultural products in developing countries are produced on small farms and in labor-intensive ways, though there is wide variation among crops and countries. With appropriate policies and technology, horticultural production could significantly supplement the income of small farmers and provide additional employment in labor-abundant developing countries. Also, given the urgent need for increased export earnings and the not-too-bright prospects for traditional agricultural exports, the horticultural sector could be an important source of additional foreign exchange. Horticultural products are expected to have better prospects because import demand is growing in the higher-income developing countries, as well as in the developed countries.

Although the domestic market generally dominates the demand for horticultural products, the export market's share is rising for many products, thus providing an additional source of future growth. At the same time, a large domestic market in developing countries, resulting from overall growth in income and high income elasticities of demand, provides a cushion to offset volatility and a springboard for entry into the export market.

But the main source of growth in export markets undoubtedly lies in the developed-country markets, assuming that the ratio of imports to domestic demand continues to rise in response to the diversification of consumption. Improved transportation and communication facilities reduce prices and also widen the range of internationally traded horticultural products. Acceleration of income growth rates in developing countries and liberalization of consumption and import trade in centrally planned economies also could provide growing markets.

Developing countries face intense competition in export markets, except in tropical products, which, however, constitute a rather small proportion of world horticultural trade. Except in "off season" markets, developed countries are both producers and exporters of temperate-zone products.

In order to capture an increasing share of world export markets, developing countries need to strengthen their competitive position by reducing costs and improving quality through extension services and training at the farmer's level. Different horticultural products require different intensities of labor and input use in the same country, but

the amount of inputs required for the same product may vary among countries. The comparative cost advantages in particular commodities change across countries and over time as a result of research and development efforts. For example, the steady stream of biological and mechanical innovations in developed countries in many instances offset the advantage of lower labor costs in developing countries.

This emphasizes the need for technological research in the horticultural sector, which to date is underdeveloped. But, in view of the scarcity of available resources and the wide variety of products involved, on the one hand, and the need for a critical mass of research effort, on the other, to develop a feasible technological package for an individual commodity, the choice of products in which a country will specialize assumes great importance. Cooperation among developing countries in research and development efforts could also conserve resources and provide economies of scale.

Since about 70 percent of the final consumer price is accounted for by the cost of processing, distributing, marketing, and transporting the product, the comparative cost advantage, in many instances, depends more on how efficiently and effectively these services are organized than on the actual cost of cultivation.

Farms varying widely in size and in methods of organization in different countries have engaged successfully in export trade. Economies of scale seem to relate more to postharvest activities than to production. How to integrate small farmers into a system of efficiently organized postharvest activities that yield economies of scale and how to promote the appropriate institutional arrangements for this purpose are questions that pose a considerable challenge for developing countries.

The alternative institutional or organizational systems range from farmers' cooperatives to "contract" farming by small farmers for exporters or foreign importers or processing firms. Multinational enterprises often combine production and processing activities with marketing outlets in the importing countries.

The availability of market intelligence and information on world horticultural trade is still rather undeveloped, compared with what is available for other agricultural commodities such as raw materials or tropical beverages. Also, the ability to respond to export market opportunities and to adjust to changes therein requires close, intensive contact with the marketing and distribution systems in importing countries.

An enhanced capacity on the part of developing countries to provide an adequate volume of exports of high and uniform quality is only part of the answer: a reduction of trade barriers in the principal markets abroad must supplement these efforts. Processed products with high value added provide more employment and income than fresh products, but because the degree of restrictions escalates with the degree of processing, they also face higher restrictions in developed-country markets.

The future of trade liberalization in horticultural products is linked with the success of the ongoing GATT negotiations on agriculture. Even though tropical horticultural products are slated to receive early and favorable treatment, they constitute a very small share of the world horticultural trade. Most developing-country exports are in commodities that compete with those of developed countries. During the current round of GATT negotiations, developing countries, especially the high-income developing countries, will be called upon to make reciprocal concessions, though not to the same extent as the developed countries. This should open up markets in the high-income developing countries for the rest.

In the future, the generalized system of preferences (GSP) is likely to be limited to the least-developed countries, whose participation in world horticultural trade is in any case very small. In the past, the GSP scheme not only had limited coverage but also was highly unstable, and it failed to provide assured markets, even for countries

on a most-favored-nation basis. If substantial concessions are made on horticultural products, particularly on processed products, exports of developing countries will probably be stimulated, especially if the developed countries make the fastest and most substantial concessions on the labor-intensive commodities in which the developing countries are likely to enjoy comparative advantage.

Furthermore, an international agreement to harmonize phytosanitary and sanitary measures, under the auspices of the GATT, and an effective mechanism for international surveillance to preclude trade-distorting effects would confer substantial benefits on exporting developing countries, especially if these measures are combined with international assistance to improve the scientific and technical capacity of developing countries to implement and monitor them.

Given the same external economic and trade environment and similar agroecological endowments, why have some countries successfully exported horticultural exports and others failed to do so? This question raises a number of others about the appropriate technology, organization, institutions, and policy framework required to improve production and marketing.

This study has touched on only a few issues in a preliminary way and on the basis of scattered and limited evidence. It is necessary to follow up with detailed country studies bearing on these issues, which will be helpful in devising an appropriate strategy for expanding the horticultural sectors of developing countries.

Table 40—Three-year average export values of fruits, by commodity, and share of developing countries in world trade, 1961-85

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
Fresh fruits	1,565,290	694,965	44	2,833,285	1,218,350	43	54,778,631	2,146,690	39	8,424,558	3,658,417	43
Bananas and plantains	323,122	302,245	94	550,546	513,631	93	879,110	819,236	93	1,451,592	1,356,443	93
Bananas	321,658	300,781	94	546,155	509,240	93	874,477	814,603	93	1,436,067	1,340,918	93
Plantains	1,464	1,464	100	4,391	4,391	100	4,633	4,633	100	15,524	15,524	100
Citrus fruits	480,817	143,540	30	839,199	293,321	29	1,619,092	444,684	27	2,337,374	736,272	31
Oranges	343,204	104,927	31	499,381	163,577	33	910,372	291,497	32	1,237,046	447,287	36
Tangerines and mandarins	39,532	25,250	64	110,024	41,673	38	276,471	81,246	29	441,583	106,066	24
Lemons and limes	70,128	6,461	9	149,513	17,498	12	272,441	44,435	16	376,758	94,356	25
Grapefruit and pomelo	27,603	6,645	24	79,310	15,664	20	156,681	25,926	17	273,532	82,852	30
Citrus fruit n.e.s.	350	258	74	972	908	93	3,127	1,580	51	8,561	5,111	60
Tropical fruits	45,638	37,346	82	88,972	69,298	78	182,343	120,219	66	503,526	296,282	59
Mangoes	964	962	100	2,435	2,382	98	10,192	9,643	95	35,084	31,102	89
Avocados	151	151	100	4,087	576	14	22,279	975	4	90,187	10,080	11
Pineapples	6,397	5,499	86	21,997	18,675	85	36,283	32,011	88	96,840	84,898	88
Dates	35,930	28,767	80	51,198	40,795	80	86,982	65,408	75	139,827	112,103	80
Persimmons	400	400	100	2,267	2,267	100	4,300	4,300	100	8,968	6,092	68
Papayas	0	0	0	1,767	38	2	8,222	39	0	6,700	2,538	38
Fruit, tropical fresh n.e.s.	1,797	1,567	87	5,222	4,566	87	14,086	7,843	56	125,919	49,470	39
Miscellaneous fruits	551,417	88,416	16	1,047,643	163,648	16	2,251,582	348,006	15	3,404,704	756,455	22
Apples	226,661	50,117	22	406,325	74,381	18	906,058	173,097	19	1,136,493	222,549	20
Pears	57,905	5,797	10	104,971	18,993	18	206,660	43,253	21	291,978	72,197	25
Quinces	142	23	16	261	75	29	969	509	52	1,095	857	78
Apricots	10,000	1,259	13	14,984	1,482	10	26,262	2,270	9	47,261	3,616	8
Sour cherries	1,524	8	1	2,549	11	0	4,163	0	0	4,184	0	0
Cherries	11,754	181	2	24,599	393	2	57,628	1,314	2	75,112	5,643	8
Peaches and nectarines	47,352	903	2	115,607	2,296	2	283,449	6,221	2	344,277	23,803	7
Plums	14,566	894	6	26,472	1,541	6	54,839	3,673	7	83,280	18,725	22

(continued)

Table 40—Continued

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
Stone fruit n.e.s.	783	193	25	3,179	550	17	4,142	1,559	38	12,046	6,416	53
Strawberries	13,702	137	1	69,653	8,761	13	147,822	6,535	4	212,596	4,738	2
Raspberries	2,606	0	0	2,675	0	0	4,246	0	0	14,436	0	0
Gooseberries	81	0	0	392	0	0	1,385	1	0	4,245	0	0
Currants	2,439	0	0	8,476	0	0	9,396	0	0	4,415	4	0
Blueberries	2,698	0	0	2,860	0	0	3,824	0	0	10,527	0	0
Cranberries	4	0	0	16	0	0	79	0	0	390	0	0
Berries n.e.s.	6,483	2	0	6,666	77	1	12,430	301	2	19,894	257	1
Grapes	119,946	11,878	10	183,673	21,227	12	377,183	48,629	13	745,557	227,145	30
Watermelons	9,600	5,369	56	22,125	7,373	33	42,258	11,180	26	104,472	54,679	52
Cantaloupes and other melons	11,290	7,983	71	30,927	16,962	55	64,214	27,260	42	112,001	38,347	34
Figs	104	35	34	326	15	5	756	128	17	2,997	1,560	52
Fruit, fresh n.e.s.	11,778	3,637	31	20,907	9,512	45	43,821	22,078	50	177,450	75,919	43
Treenuts	164,295	123,418	75	306,924	232,452	76	545,734	414,545	76	727,363	512,964	71
Brazil nuts	8,889	7,656	86	11,217	8,863	79	15,293	13,195	86	19,647	17,123	87
Cashew nuts	21,826	21,797	100	38,537	38,411	100	42,434	40,939	96	41,492	36,207	87
Chestnuts	10,388	4,278	41	26,918	13,495	50	47,866	28,112	59	116,082	84,594	73
Almonds	13,664	10,382	76	20,995	15,110	72	21,963	13,955	64	37,602	13,436	36
Walnuts	20,984	7,068	34	33,909	13,185	39	78,229	28,967	37	104,764	39,347	38
Pistachios	7,523	6,582	87	22,084	20,778	94	54,160	50,316	93	56,685	39,400	70
Kolanuts	1,590	1,590	100	4,117	4,117	100	4,809	4,809	100	5,131	5,131	100
Hazelnuts (filberts)	58,071	50,074	86	108,379	97,104	90	215,968	198,505	92	198,183	181,979	92
Areca nuts (betel)	1,193	1,193	100	1,022	1,022	100	3,648	3,609	99	20,933	20,872	100
Nuts n.e.s.	16,182	10,021	62	31,643	15,399	49	46,071	22,701	49	90,553	48,745	54
Coconuts	2,177	2,157	99	3,487	3,134	90	8,085	6,780	84	14,666	12,382	84
Olives	150	21	14	360	206	57	1,148	916	80	701	149	21
Melonseed	1,656	598	36	4,258	1,627	38	6,061	1,743	29	20,923	14,199	68
Processed fruits	910,832	244,996	27	1,763,694	546,690	31	3,661,250	1,204,678	33	6,771,743	2,776,255	41
Juices (nontropical)	92,283	12,537	14	297,058	54,073	18	757,735	175,399	23	2,183,009	1,053,220	48
Orange juice, single-strength	24,220	4,167	17	79,075	10,048	13	139,178	17,862	13	259,780	43,380	17
Orange juice, concentrated	26,229	3,245	12	66,867	32,282	48	195,508	121,729	62	1,159,941	935,345	81

(continued)

Table 40—Continued

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
Tangerine juice	0	0	0	0	0	0	910	910	100	8,638	8,638	100
Lemon juice, single strength	4,385	1,298	30	10,809	1,747	16	22,934	4,147	18	30,647	5,248	17
Lemon juice, concentrated	0	0	0	78	4	5	753	494	66	8,412	2,128	25
Grapefruit juice, single-strength	5,833	1,484	25	21,069	1,336	6	26,714	869	3	23,466	724	3
Grapefruit juice, concentrated	3,092	306	10	5,360	499	9	8,003	1,062	13	56,449	4,414	8
Citrus juice, single-strength	421	400	95	1,211	784	65	3,721	928	25	3,732	1,450	39
Citrus juice, concentrated	52	0	0	316	0	0	1,642	0	0	5,109	1,045	20
Apple juice, single-strength	543	0	0	7,021	0	0	19,617	0	0	53,328	1	0
Apple juice, concentrated	193	0	0	10,326	0	0	27,914	0	0	133,961	0	0
Plum juice, single-strength	0	0	0	0	0	0	0	0	0	0	0	0
Plum juice, concentrated	0	0	0	0	0	0	0	0	0	0	0	0
Fruit juice n.e.s.	27,315	1,637	6	94,930	7,373	8	310,841	27,399	9	439,567	50,848	12
Juices (tropical)	4,992	1,265	25	12,177	7,473	61	18,972	12,481	66	77,486	46,381	60
Pineapple juice, single-strength	2,102	1,265	60	8,408	4,568	54	14,121	8,355	59	64,132	33,961	53
Pineapple juice, concentrated	2,890	0	0	3,769	2,905	77	4,851	4,125	85	13,113	12,179	93
Mango juice	0	0	0	0	0	0	0	0	0	240	240	100
Mango pulp	0	0	0	0	0	0	0	0	0	1	1	100
Other nontropical fruits	523,313	88,868	17	866,792	192,462	22	1,782,005	431,122	24	2,585,105	709,118	27
Dried apricots	3,440	1,022	30	5,618	2,328	41	14,995	10,051	67	37,330	32,171	86
Plums, dried (prunes)	31,225	2,062	7	38,454	4,739	12	79,580	11,194	14	122,376	9,980	8
Raisins	106,533	32,620	31	141,415	50,490	36	332,534	139,464	42	453,296	176,155	39
Figs, dried	13,208	8,734	66	14,484	9,240	64	33,956	22,579	66	45,134	32,229	71
Fruit, dried, n.e.s.	16,105	4,714	29	24,114	11,026	46	38,911	15,553	40	82,867	22,398	27
Fruit, prepared, n.e.s.	352,473	39,567	11	641,709	114,464	18	1,277,105	230,350	18	1,937,960	435,478	24
Flour of fruit	330	149	45	997	175	18	4,924	1,930	39	6,143	707	12

(continued)

Table 40—Continued

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
Other tropical fruits	73,462	50,965	69	125,150	100,031	80	252,628	214,243	85	360,940	315,059	87
Pineapples, canned	71,874	49,393	69	122,888	97,996	80	247,086	209,080	85	358,034	312,557	87
Fruit, tropical, dried, n.e.s.	1,587	1,571	99	2,262	2,034	90	5,542	5,164	93	2,906	2,502	86
Treenuts	216,783	91,362	42	462,518	192,652	42	849,911	371,433	44	1,565,204	642,476	41
Brazilnuts, shelled	4,425	4,425	100	7,803	7,803	100	13,954	13,954	100	15,134	15,134	100
Cashew nuts, shelled	43,503	43,503	100	109,528	109,528	100	197,726	197,726	100	258,306	258,306	100
Almonds, shelled	80,099	8,609	11	137,995	15,881	12	211,571	20,938	10	394,523	19,852	5
Walnuts, shelled	5,903	1,533	26	9,450	3,233	34	19,389	5,157	27	43,282	16,616	38
Hazelnuts, shelled	16,613	0	0	32,965	0	0	51,092	4,397	9	207,726	87,559	42
Prepared nuts[a]	302	0	0	28,872	0	0	70,060	870	1	221,094	39,059	18
Prepared groundnuts	4	0	0	2,541	321	13	7,983	954	12	18,345	3,235	18
Coconuts, desiccated	28,462	28,284	99	38,566	38,237	99	86,343	83,607	97	163,994	155,994	95
Olives, preserved	37,473	5,007	13	94,798	17,649	19	191,792	43,831	23	242,799	46,721	19
Total fruits	2,476,122	939,961	38	4,596,979	1,765,040	38	9,139,111	3,351,368	37	15,196,301	6,424,672	42

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: n.e.s. is "not elsewhere specified."
[a]Excludes groundnuts.

Table 41—Growth rates of fruit export values in the world and developing countries, 1965-75 and 1975-85

Commodity	World		Developing Countries	
	1965-75	1975-85	1965-75	1975-85
		(percent)		
Fresh fruits	9.55	7.73	5.51	6.85
Bananas and plantains	5.19	6.66	5.05	6.71
Bananas	5.19	6.58	5.05	6.62
Plantains	4.77	17.74	4.77	17.74
Citrus fruits	9.78	4.57	9.12	6.60
Oranges	7.51	3.81	8.39	5.53
Tangerines and mandarins	15.13	6.04	6.72	3.91
Lemons and limes	11.77	3.88	19.72	10.07
Grapefruit and pomelo	15.33	6.98	13.25	15.63
Citrus fruit n.e.s.	16.61	11.43	15.65	14.35
Tropical fruits	11.78	13.32	11.25	11.72
Mangoes	22.58	18.06	22.20	17.32
Avocados	42.22	19.12	19.52	31.01
Pineapples	14.12	12.49	14.86	12.42
Dates	8.44	5.85	8.76	6.58
Persimmons	19.23	10.52	19.23	5.94
Papayas	12.58	-3.24	10.09	66.47
Fruit, tropical fresh n.e.s.	15.43	31.51	11.70	25.70
Miscellaneous fruits	11.35	5.40	9.73	10.03
Apples	11.56	3.15	9.19	3.14
Pears	10.20	4.79	10.64	6.93
Quinces	13.28	1.81	37.28	7.94
Apricots	8.67	7.02	7.86	5.46
Sour cherries	16.69	-0.68	6.55	0.00
Cherries	16.64	3.23	24.03	19.26
Peaches and nectarines	13.03	2.63	13.31	19.02
Plums	8.78	5.24	13.13	22.64
Stone fruit n.e.s.	19.65	13.77	10.95	16.33
Strawberries	18.73	4.19	21.18	-7.09
Raspberries	3.50	16.61	0.00	0.00
Gooseberries	25.99	15.74	0.00	0.00
Currants	10.63	-10.27	0.00	-15.28
Blueberries	-5.25	15.63	0.00	0.00
Cranberries	-4.85	33.80	0.00	0.00
Berries n.e.s.	9.67	7.10	85.40	-0.20
Grapes	8.52	8.74	9.06	20.81
Watermelons	13.40	11.72	6.94	21.19
Cantaloupes and other melons	11.41	6.92	8.44	3.40
Figs	12.32	17.83	10.82	38.80
Fruit, fresh n.e.s.	11.65	19.46	12.15	17.52
Treenuts	9.75	3.19	9.89	1.76
Brazil nuts	6.79	2.03	6.70	1.88
Cashew nuts	5.95	1.18	5.84	0.05
Chestnuts	10.13	10.51	10.92	13.34
Almonds	11.30	6.34	13.20	-3.14
Walnuts	10.68	4.25	12.22	4.02
Pistachios	13.85	0.44	13.98	-3.26
Kolanuts	3.71	1.67	3.71	1.67
Hazelnuts (filberts)	10.15	-8.48	10.37	-19.55
Areca nuts (betel)	7.88	23.63	7.84	23.75
Nuts n.e.s.	10.28	9.07	10.85	9.82
Coconuts	8.49	7.22	9.67	7.44
Olives	-14.37	-3.10	-18.86	-16.06
Melonseed	11.97	16.61	14.91	29.06

(continued)

Table 41—Continued

Commodity	World		Developing Countries	
	1965-75	1975-85	1965-75	1975-85
		(percent)		
Processed fruits	11.86	11.73	8.05	11.17
Juices (nontropical)	21.04	13.89	21.93	24.60
Orange juice, single-strength	17.52	8.27	10.21	13.08
Orange juice, concentrated	20.91	23.98	31.86	28.08
Tangerine juice	0.00	32.39	0.00	39.12
Lemon juice, single-strength	13.66	4.57	3.86	−0.32
Lemon juice, concentrated	92.13	30.31	111.12	16.01
Grapefruit juice, single-strength	13.92	−0.53	0.69	−1.53
Grapefruit juice, concentrated	20.01	26.29	16.01	21.05
Citrus juice, single-strength	12.95	1.09	6.32	6.80
Citrus juice, concentrated	54.66	14.71	0.00	35.11
Apple juice, single-strength	24.03	15.16	0.00	−47.68
Apple juice, concentrated	41.84	21.46	0.00	−8.45
Plum juice, single-strength	0.00	−38.15	0.00	−38.15
Plum juice, concentrated	0.00	26.71	0.00	26.71
Fruit juice n.e.s.	24.62	4.52	20.24	9.80
Juices (tropical)	9.48	19.18	14.85	17.77
Pineapple juice, single-strength	7.12	20.74	11.01	18.91
Pineapple juice, concentrated	21.78	13.36	26.16	15.02
Mango juice	0.00	202.30	0.00	202.30
Mango pulp	0.00	0.00	0.00	0.00
Other nontropical fruits	10.02	4.87	13.61	6.62
Dried apricots	9.88	12.40	17.31	15.78
Plums, dried (prunes)	8.72	6.16	14.70	−2.04
Raisins	8.85	4.17	13.65	3.07
Figs, dried	9.66	3.56	10.07	4.64
Fruit, dried, n.e.s.	6.47	9.29	10.24	4.35
Fruit, prepared, n.e.s.	10.54	4.73	14.21	8.58
Flour of fruit	31.52	3.25	16.92	−8.93
Other tropical fruits	8.01	4.70	8.62	5.09
Pineapples, canned	8.00	4.87	8.63	5.29
Fruit, tropical, dried, n.e.s.	8.58	−6.72	7.86	−7.75
Treenuts	10.39	8.04	9.18	7.71
Brazilnuts shelled	8.76	0.55	8.76	0.55
Cashew nuts shelled	12.05	4.87	12.05	4.87
Almonds, shelled	6.13	7.28	−2.49	−1.88
Walnuts, shelled	7.60	11.17	2.23	16.23
Hazelnuts, shelled	9.15	15.77	0.00	17.98
Prepared nuts[a]	41.64	15.76	0.00	122.96
Prepared groundnuts	24.54	13.31	37.57	16.94
Coconuts, desiccated	6.96	8.46	6.89	8.18
Olives, preserved	13.59	3.20	15.04	0.09
Total fruits	10.29	8.97	6.57	8.51

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: n.e.s. is "not elsewhere specified."
[a] Excludes groundnuts.

Table 42—Continued

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
String beans	0	0	0	16	16	100	6	6	100	104	104	100
Carrots	25,278	4,874	19	30,687	2,126	7	78,198	2,101	3	116,715	4,009	3
Okra	0	0	0	0	0	0	0	0	0	370	370	100
Green corn (maize)	0	0	0	0	0	0	0	0	0	27	0	0
Mushrooms	7,967	226	3	16,590	1,464	9	35,272	6,901	20	90,240	29,706	33
Chicory roots	1,638	0	0	2,476	0	0	3,983	186	5	3,917	2	0
Vegetable products, fresh or dried	3,979	464	12	8,741	2,968	34	18,659	8,198	44	44,195	10,219	23
Carobs	6,531	2,393	37	11,141	6,572	59	16,247	7,847	48	29,996	10,213	34
Vegetables, fresh, n.e.s.	67,740	29,560	44	159,032	85,444	54	240,421	81,758	34	463,312	182,150	39
Processed vegetables	495,673	131,509	26	1,225,312	394,582	30	2,964,632	910,717	31	5,103,077	1,609,086	32
Roots and tubers	5,512	4,540	82	13,185	3,057	23	72,039	6,603	9	252,691	8,059	3
Flour of potatoes	886	145	16	9,974	1,099	11	65,513	2,649	4	58,125	3,837	7
Frozen potatoes	0	0	0	1	0	0	485	0	0	187,797	12	0
Potato, tapioca	281	154	55	354	6	2	566	7	1	1,611	31	2
Flour of roots and tubers	4,336	4,232	98	2,783	1,950	70	5,475	3,946	72	4,469	4,180	94
Roots and tubers, dried	10	10	100	74	3	4	0	0	0	0	0	0
Pulses	187,758	95,687	51	326,433	163,240	50	717,487	376,767	53	1,282,306	622,985	49
Beans, dry	79,355	33,700	42	139,761	69,410	50	341,173	178,300	52	515,439	298,536	58
Broad beans, dry	11,840	11,423	96	20,362	19,605	96	29,103	26,432	91	69,340	36,141	52
Peas, dry	47,903	8,400	18	73,285	10,427	14	141,556	13,283	9	339,950	4,003	1
Chickpeas	14,547	13,178	91	23,621	21,919	93	46,360	44,958	97	111,580	110,302	99
Cow peas, dry	496	496	100	583	583	100	8,129	8,129	100	6,117	6,117	100
Pigeon peas	2,069	2,069	100	3,499	3,499	100	4,007	4,007	100	6,052	6,052	100
Lentils	14,142	11,522	81	30,418	18,660	61	95,876	70,474	74	156,150	106,161	68
Pulses n.e.s.	16,128	13,933	86	33,831	18,576	55	48,859	29,792	61	69,371	48,943	71
Flour of pulses	1,276	966	76	1,073	561	52	2,423	1,392	57	8,307	6,730	81
Miscellaneous vegetables	302,403	31,282	10	885,693	183,284	21	2,175,106	527,348	24	3,568,770	978,042	27
Tomato juice, concentrated	0	0	0	3	0	0	50	0	0	5	0	0
Tomato juice, single-strength	6,943	34	0	13,067	126	1	29,469	2,644	9	33,896	10,497	31
Tomato paste	54,999	1,143	2	120,018	5,033	4	309,647	33,927	11	504,170	59,780	12

(continued)

Table 42—Three-year average export values of vegetables, by commodity, and share of developing countries in world trade, 1961-85

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
Fresh vegetables	773,631	171,034	22	1,452,058	376,407	26	3,108,964	612,182	20	4,476,262	1,052,482	23
Roots and tubers	185,624	36,417	20	291,042	52,004	18	886,780	145,461	16	879,033	206,461	24
Potatoes	184,081	35,475	19	281,447	47,075	17	865,778	128,235	15	813,338	149,674	18
Sweet potatoes	671	196	29	2,941	1,249	42	4,334	3,238	75	12,093	9,022	75
Yautia	30	30	100	783	783	100	2,420	2,420	100	5,029	5,029	100
Taro	97	97	100	314	314	100	1,180	1,180	100	2,843	2,843	100
Yams	58	54	93	1,410	1,395	99	3,450	3,342	97	11,979	11,824	99
Roots and tuber n.e.s.	687	565	82	4,147	1,188	29	9,618	7,046	73	33,752	30,070	89
Hops	47,818	49	0	74,508	6	0	108,445	21	0	208,269	5,562	3
Miscellaneous vegetables	540,190	134,569	25	1,086,508	324,297	30	2,113,739	466,700	22	3,338,960	838,459	25
Sugarcane	9,821	9,821	100	9,587	9,569	100	10,647	10,647	100	20.908	20,901	100
Sugar beets	3,720	18	0	726	12	2	13,392	15	0	6,958	51	1
Cabbages	14,568	1,277	9	27,031	3,047	11	69,405	9,266	13	113,089	18,898	17
Artichokes	4,494	3,574	80	8,328	1,208	15	14,948	428	3	18,924	1,222	6
Asparagus	6,654	155	2	19,683	820	4	35,931	1,162	3	92,491	4,151	4
Lettuce	63,850	14	0	117,740	2	0	219,227	37	0	280,105	295	0
Spinach	1,879	0	0	935	0	0	2,203	66	3	4,499	272	6
Tomatoes	170,729	47,790	28	362,599	144,148	40	623,610	203,811	33	949,245	279,858	29
Cauliflower	18,696	147	1	33,652	1,324	4	68,319	1,101	2	105,403	4,299	4
Pumpkins, squash, gourds	1,119	166	15	4,255	3,835	90	13,835	4,946	36	50,797	13,401	26
Cucumbers and gherkins	28,625	0	0	80,229	4,535	6	197,354	9,160	5	282,671	49,635	18
Eggplants	862	670	78	6,311	1,860	29	15,163	5,161	34	37,979	11,958	31
Chilies and peppers, green	8,164	582	7	25,305	2,779	11	77,082	2,561	3	190,961	7,944	4
Onions and shallots, green	1,252	876	70	4,142	2,800	68	13,988	4,327	31	39,615	11,862	30
Onions, dry	67,004	24,540	37	111,522	31,890	29	245,053	64,137	26	311,450	105,172	34
Garlic	11,958	4,725	40	25,366	14,611	58	59,933	37,794	63	80,413	54,703	68
Beans, green	11,487	1,953	17	16,504	2,536	15	33,375	3,747	11	37,479	13,746	37
Peas, green	1,698	604	36	2,629	736	28	5,610	922	16	12,125	2,916	24
Broad beans, green	477	140	29	1,279	94	7	1,880	415	22	4,971	404	8

(continued)

Table 43—Growth rates of vegetable export values in the world and developing countries, 1965-75 and 1975-85

Commodity	World		Developing Countries	
	1965-75	1975-85	1965-75	1975-85
		(percent)		
Fresh vegetables	10.21	5.11	7.07	7.49
Roots and tubers	10.07	1.09	8.95	6.03
Potatoes	9.76	0.44	7.40	3.70
Sweet potatoes	24.23	12.63	26.31	12.58
Yautia	40.43	10.17	40.43	10.17
Taro	22.71	11.06	22.71	11.06
Yams	33.37	16.23	33.82	16.52
Roots and tubers n.e.s.	26.14	16.19	24.43	18.84
Hops	8.64	8.89	-10.86	90.96
Miscellaneous vegetables	10.38	6.25	6.71	7.87
Sugarcane	11.97	14.04	12.04	14.03
Sugar beets	-3.21	-2.75	-11.86	27.50
Cabbages	11.38	7.38	15.98	9.75
Artichokes	8.73	2.25	-11.34	13.60
Asparagus	14.84	12.22	24.73	18.15
Lettuce	10.06	3.10	24.49	25.76
Spinach	4.29	9.49	0.00	40.03
Tomatoes	10.17	5.39	8.70	4.34
Cauliflower	10.66	5.55	39.67	20.18
Pumpkins, squash, gourds	30.42	16.88	24.71	12.37
Cucumbers and gherkins	14.80	4.22	21.43	21.85
Eggplants	20.44	12.36	17.20	10.69
Chilies and peppers, green	16.28	12.38	15.29	14.11
Onions and shallots, green	9.81	16.53	7.50	12.96
Onions dry	10.60	3.83	4.64	7.69
Garlic	14.28	4.20	18.00	5.00
Beans, green	6.78	1.95	10.68	16.56
Peas, green	8.65	9.99	7.13	13.08
Broad beans, green	12.66	13.43	-2.43	0.98
String beans	-45.66	67.56	-45.66	63.79
Carrots	8.95	6.62	-4.70	10.90
Okra	0.00	22.70	0.00	22.70
Green corn (maize)	0.00	29.02	0.00	0.00
Mushrooms	7.31	11.32	18.91	17.12
Chicory roots	4.09	0.02	0.00	-41.40
Vegetable products, fresh or dried	18.43	11.96	22.95	2.79
Carobs	8.36	8.87	6.90	4.58
Vegetables, fresh n.e.s.	6.68	8.64	-2.20	10.49
Processed vegetables	15.22	7.34	15.36	7.79
Roots and tubers	18.93	18.85	2.38	3.00
Flour of potatoes	27.72	0.19	27.61	5.50
Frozen potatoes	193.20	102.81	0.00	0.00
Potato, tapioca	-3.98	12.91	-38.79	18.06
Flour of roots and tubers	1.19	-1.56	-0.98	0.78
Roots and tubers, dried	69.37	0.00	-0.76	0.00
Pulses	10.59	8.19	10.03	0.98
Beans, dry	14.39	6.58	12.85	7.18
Broad beans, dry	5.65	12.93	4.86	5.73
Peas, dry	5.34	11.24	1.13	-16.12
Chickpeas	9.66	11.23	9.98	11.67
Cow peas, dry	-18.82	-19.31	-18.82	-19.31
Pigeon peas	-3.43	5.45	-3.43	5.45
Lentils	14.62	7.15	14.64	5.98
Pulses n.e.s.	10.13	4.70	7.27	8.09
Flour of pulses	11.29	16.03	12.09	21.95

(continued)

Table 42—Continued

Commodity	1961-63			1970-72			1975-77			1983-85		
	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share	World	Developing Countries	Developing Countries' Share
	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)	(US$ 1,000)		(percent)
Peeled tomatoes	32,646	0	0	65,191	88	0	118,696	3,160	3	266,634	10	0
Dried mushrooms	3,256	603	19	9,334	1,085	12	23,067	8,517	37	52,897	25,528	48
Canned mushrooms	8,064	0	0	41,509	0	0	137,773	36,554	27	295,847	90,919	31
Vegetables, dried n.e.s.	628	0	0	3,964	72	2	5,926	246	4	7,936	566	7
Vegetables, canned n.e.s.	44,958	7,804	17	60,991	33,950	56	150,612	91,645	61	293,202	208,930	71
Juice of vegetables n.e.s.	455	384	84	5,561	1,739	31	13,969	5,676	41	14,472	4,901	34
Vegetables, dehydrated	34,021	8,475	25	92,610	20,323	22	207,509	57,379	28	371,399	112,775	30
Vegetables preserved by vinegar	14,466	647	4	51,494	3,165	6	119,445	9,704	8	191,457	28,309	15
Vegetables, prepared n.e.s.	75,246	10,811	14	346,044	107,405	31	793,255	231,206	29	930,798	302,184	32
Vegetables, frozen	21,263	101	0	53,123	1,662	3	207,609	16,174	8	506,740	80,497	16
Vegetables, temporarily preserved	5,459	1,280	23	22,785	8,635	38	58,080	30,516	53	99,317	53,146	54
Total vegetables	1,269,305	302,544	24	2,677,370	725,989	27	6,073,596	1,522,900	25	9,599,340	2,661,569	28

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: n.e.s. is "not elsewhere specified."

Table 43—Continued

Commodity	World		Developing Countries	
	1965-75	1975-85	1965-75	1975-85
		(percent)		
Miscellaneous vegetables	17.39	6.54	23.05	8.39
Tomato juice, concentrated	-29.03	-7.66	0.00	0.00
Tomato juice, single-strength	13.14	1.83	39.87	22.61
Tomato paste	16.18	6.53	32.22	8.08
Peeled tomatoes	14.11	10.46	81.76	-43.61
Dried mushrooms	27.26	10.95	24.78	15.37
Canned mushrooms	25.94	10.84	-1.67	12.68
Vegetables, dried n.e.s	5.69	6.22	10.87	4.17
Vegetables, canned n.e.s.	11.44	8.99	23.60	11.27
Juice of vegetables n.e.s.	28.76	0.88	21.25	-0.62
Vegetables, dehydrated	15.11	7.73	18.62	9.01
Vegetables, preserved by vinegar	19.45	5.42	27.82	14.41
Vegetables, prepared n.e.s.	19.62	2.19	20.90	3.92
Vegetables, frozen	18.43	12.69	57.24	24.22
Vegetables, temporarily preserved	14.83	6.55	23.54	7.17
Total vegetables	12.53	6.25	11.39	7.67

Source: Data on horticultural products compiled by the author from various FAO sources.
Note: n.e.s. is "not elsewhere specified."

Table 44—Three-year average values of agricultural and horticultural exports of selected developing countries and regions and their share of world trade, 1961-85

Country	1961-63				1970-72			
	Agriculture	Fruits and Vegetables	Market Share	Fruits and Vegetables/ Agriculture	Agriculture	Fruits and Vegetables	Market Share	Fruits and Vegetables/ Agriculture
	(US$ million)		(percent)		(US$ million)		(percent)	
Brazil	1,129.84	24.05	0.64	2.13	2,196.27	75.80	1.03	3.45
Turkey	328.43	90.43	2.40	27.53	570.61	182.19	2.48	31.93
China (excluding Taiwan)	n.a.	64.10	1.70	n.a.	n.a.	172.33	2.34	n.a.
China (Taiwan Province)	n.a.	37.74	1.00	n.a.	n.a.	221.16	3.00	n.a.
Mexico	499.79	53.62	1.42	10.73	752.05	188.03	2.55	25.00
Philippines	419.85	26.62	0.70	6.34	531.36	65.75	0.89	12.37
Chile	30.69	16.92	0.45	55.13	41.00	24.95	0.34	60.86
Thailand	390.57	5.80	0.15	1.49	581.26	21.99	0.61	3.79
Morocco	156.17	100.48	2.66	64.34	254.05	195.14	2.65	76.81
Argentina	1,103.02	41.18	1.09	3.73	1,481.73	86.64	1.18	5.85
Honduras	62.06	38.65	1.02	62.28	137.03	90.26	1.23	65.86
Costa Rica	81.92	21.02	0.56	25.66	190.12	73.58	1.00	38.70
India	640.86	57.68	1.53	9.00	715.26	102.52	1.39	14.33
Hong Kong	91.70	17.39	0.46	18.97	129.63	24.07	0.33	18.57
Colombia	365.65	12.81	0.34	3.50	588.08	18.27	0.25	3.11
Singapore	212.54	27.45	0.73	12.92	278.73	36.57	0.50	13.12
Egypt	338.30	28.11	0.74	8.31	527.22	47.81	0.65	9.07
Cuba	596.06	4.21	0.11	0.71	749.49	5.01	0.07	0.67
Ecuador	130.98	85.32	2.26	65.14	191.89	99.63	1.35	51.92
Afghanistan	32.56	13.05	0.35	40.07	72.31	34.04	0.46	47.08
Korea, Republic of	15.32	0.42	0.01	2.75	98.14	11.95	0.16	12.17
Cyprus	25.21	18.99	0.50	75.31	70.78	55.34	0.75	78.18
Lebanon	33.48	17.55	0.46	52.41	83.11	38.59	0.52	46.43
Guatemala	112.93	11.16	0.30	9.88	212.48	21.23	0.29	9.99
Côte d'Ivoire	147.41	14.30	0.38	9.70	332.49	35.29	0.48	10.62
Panama	18.10	15.20	0.40	83.96	74.76	63.27	0.66	84.63
Malaysia	596.45	20.58	0.54	3.45	712.95	26.68	0.36	3.74
Kenya	115.59	4.17	0.11	3.61	189.12	14.27	0.19	7.54
Martinique	33.02	17.35	0.46	52.54	32.30	23.93	0.33	74.08
Jordan	8.97	6.20	0.16	69.12	15.18	10.81	0.15	71.20
Iran	69.31	24.10	0.64	34.77	167.34	42.56	0.58	25.43
Total	7,786.76	916.64	24.27	11.77	11,976.74	2,169.62	27.81	17.61
Developing market economies	13,173.61	1,132.45	30.38	8.60	18,618.70	2,085.65	28.71	11.22
Africa	2,829.25	305.38	8.16	10.79	4,002.90	433.57	5.96	10.83
Latin America	5,211.29	409.92	10.24	7.87	8,010.66	856.11	11.77	10.69
Near East	1,262.43	228.72	6.11	18.12	2,106.64	472.93	6.50	22.45
Far East	3,781.78	183.58	4.90	4.85	4,355.45	320.17	4.40	7.35
Other developing market economies	88.87	4.84	0.48	5.45	143.05	5.87	0.08	4.11
Asian centrally planned economies	722.44	110.06	2.94	15.23	1,478.96	402.37	5.53	27.21
World	34,131.00	3,745.43	100	10.97	57,919.55	7,274.35	100	12.56
Developed[a]	20,234.95	2,502.95	66.63	12.37	37,821.88	4,783.32	65.76	12.65
Developing[b]	13,896.05	1,242.51	33.17	8.94	20.097.66	2,491.03	34.24	12.39
China (main and Taiwan)	512.96	101.84	2.79	19.85	1,327.72	393.48	5.41	29.64

1975-77				1983-85					
Agriculture	Fruits and Vegetables	Market Share	Fruits and Vegetables/ Agriculture	Agriculture	Fruits and Vegetables	Market Share	Fruits and Vegetables/ Agriculture	Rates of Growth 1965-75	Rates of Growth 1975-85
(US$ million)		(percent)		(US$ million)		(percent)		(percent)	
6,162.30	225.45	1.45	3.66	9,604.54	1,140.35	4.44	11.87	19.10	21.34
1,128.80	424.33	2.72	37.59	2,313.49	911.17	3.55	39.38	12.90	10.55
n.a.	322.84	2.07	n.a.	n.a.	552.39	2.15	n.a.	10.73	7.10
n.a.	344.40	2.21	n.a.	n.a.	544.50	2.12	n.a.	6.07	6.36
1,242.88	328.65	2.11	26.44	1,637.20	510.62	1.99	31.19	11.07	5.64
1,364.86	194.59	1.25	14.26	1,382.87	357.90	1.39	25.88	18.03	8.51
171.21	87.00	0.56	50.81	449.50	344.26	1.34	76.59	13.82	19.17
1,908.82	92.55	2.67	4.85	3,468.69	295.96	1.19	8.53	20.28	16.56
350.51	276.35	1.77	78.84	326.47	291.57	1.14	89.31	7.34	0.09
3,049.43	250.45	1.61	8.21	5,888.07	273.65	1.07	4.65	13.25	1.39
266.00	107.08	0.69	40.26	529.10	258.58	1.01	48.87	0.01	12.58
469.93	156.09	1.00	33.22	619.89	243.66	0.95	39.31	17.67	5.70
1,780.20	190.16	1.22	10.68	2,322.60	240.28	0.94	10.35	7.82	4.73
354.12	56.19	0.36	15.87	1,291.15	189.12	0.74	14.65	9.95	17.36
1,438.78	55.63	0.36	3.87	2,283.60	176.70	0.69	7.74	5.26	15.32
640.77	71.27	0.46	11.12	1,808.55	168.37	0.66	9.31	5.69	11.54
779.51	134.42	0.85	17.24	721.82	167.12	0.65	23.15	14.66	3.67
3,270.54	22.20	0.14	0.68	5,178.18	162.07	0.63	3.13	26.21	27.51
454.74	132.77	0.85	29.20	500.29	161.20	0.63	32.22	2.63	3.34
204.22	90.28	0.58	44.21	225.28	131.35	0.51	58.31	14.43	3.99
380.85	64.85	0.42	17.03	541.80	126.07	0.49	23.27	45.43	8.20
128.89	85.76	0.55	66.54	198.03	118.52	0.46	59.85	10.65	4.98
80.75	53.45	0.34	66.19	146.37	110.13	0.43	75.24	10.51	8.28
651.38	31.79	0.20	4.88	712.33	103.24	0.40	14.49	13.36	16.95
1,143.84	65.76	0.42	5.75	1,764.77	84.09	0.33	4.76	12.86	3.12
111.09	65.24	0.42	58.73	153.63	81.66	0.32	53.15	6.45	2.56
2,045.65	53.74	0.34	2.63	4,040.63	81.27	0.32	2.01	7.15	5.38
542.25	40.32	0.26	7.44	685.47	77.57	0.30	11.32	13.62	9.04
85.10	70.49	0.45	82.84	92.67	75.05	0.29	80.99	3.59	1.15
67.06	43.78	0.28	65.28	136.79	69.57	0.27	50.86	9.09	7.12
301.02	93.13	0.60	30.94	106.94	68.01	0.26	63.60	15.77	-4.26
30,575.48	4,231.03	29.21	13.84	49,130.62	8,115.98	32.76	16.52	10.68	8.74
43,815.44	4,544.10	27.56	10.37	64,240.04	7,961.54	32.14	12.39	9.95	8.58
8,023.62	639.86	4.21	7.97	8,488.31	635.90	2.57	7.49	7.08	-0.11
20,668.20	1,698.57	11.15	8.22	30,937.94	3,864.80	15.60	12.49	9.43	10.76
3,715.36	1,066.39	7.01	28.70	5,144.37	1,816.96	7.33	35.32	12.71	7.23
11,036.82	782.97	5.15	7.09	19,108.51	1,635.05	6.60	8.56	11.41	10.20
371.64	5.35	0.04	1.44	560.92	8.83	0.04	1.57	1.81	5.75
2,884.36	681.12	4.48	23.61	5,501.06	1,125.25	4.54	20.46	8.13	6.75
136,499.83	15,212.70	100	11.14	211,693.69	24,775.33	100	11.70	11.11	6.44
89,800.02	10,338.43	67.96	11.51	141,952.58	15,688.54	63.32	11.05	11.86	5.50
46,699.90	4,874.27	32.04	10.44	69,741.10	9,086.79	36.68	13.03	9.65	8.26
2,522.39	667.24	4.39	26.45	5,131.02	1,096.89	4.43	21.38	8.24	6.67

Source: Data on horticultural products compiled by the author from various FAO sources.
Notes: Countries are listed in the order of their share of the world market in 1983-85 (in descending order).
n.a. means data were not available.
[a]Includes Eastern Europe and the U.S.S.R.
[b]Includes Asian centrally planned economies.

Table 45—Top four developing-country exporters of selected fruits, value of world trade more than US$50 million, 1983-85

Country	Bananas	Orange Juice	Orange Juice, Concentrated	Orange Juice, Single Strength	Tangerines	Lemons and Limes	Grapefruits/ Pomelo	Apples	Grapes	Raisins
Taiwan					x					
Argentina				x		x	x	x		
China										
Thailand										
Honduras	x									
Costa Rica	x									
Colombia	x									
Ecuador	x									
Morocco		x		x	x					
Cuba		x				x	x			
Egypt		x								
Cyprus		x				x	x			
Brazil			x							
Belize			x							
Singapore			x							
Jamaica			x							
Chile								x	x	x
Lebanon					x			x	x	
Turkey					x	x		x		x
Afghanistan									x	x
Cyprus									x	
Saudi Arabia										
Iran										x
Philippines										
Kenya										
Mexico				x						
Trinidad				x			x			
Pakistan										
Venezuela										
Iraq										
Tunisia										
Malaysia										
India										
Gaza Strip										
Jordan										
Côte d'Ivoire										
Martinique										
Peru										
Dominican Republic										
Hong Kong										
Korea, Republic of										
Sri Lanka										
Mozambique										
Tanzania										
Guinea-Bissau										
Kuwait										
					(percent)					
Share 1	93	36	81	14	24	24	43	20	31	39
Share 2	59	64	100	93	73	70	69	80	87	94

(continued)

Table 45—Continued

Country	Cashew nuts, Shelled	Fruits, Tropical N.E.S.	Fruits, Preserved N.E.S.	Fruits, Dried N.E.S.	Fruit Juice N.E.S.	Watermelons	Cantaloupes	Pears	Dates	Hazel nuts, Filberts	Coconuts, Desiccated
Taiwan		x	x	x							
Argentina			x					x			
China			x				x	x			
Thailand			x								
Honduras											
Costa Rica											
Colombia											
Ecuador											
Morocco											
Cuba											
Egypt					x	x					
Cyprus											
Brazil	x				x						
Belize											
Singapore								x			x
Jamaica											
Chile				x	x			x			
Lebanon											
Turkey							x			x	
Afghanistan											
Cyprus											
Saudi Arabia					x	x			x		
Iran				x					x	x	
Philippines											x
Kenya	x										
Mexico						x					
Trinidad											
Pakistan											
Venezuela		x									
Iraq									x		
Tunisia									x		
Malaysia		x									x
India	x	x									
Gaza Strip						x	x				
Jordan							x				
Côte d'Ivoire											
Martinique											
Peru											
Dominican Republic											
Hong Kong				x							
Korea, Republic of											
Sri Lanka											x
Mozambique	x										
Tanzania											
Guinea-Bissau											
Kuwait											
					(percent)						
Share 1	1	34	25	23	10	56	26	25	8	94	95
Share 2	99	78	43	70	57	87	74	87	100	100	100

(continued)

Table 45—Continued

Country	Hazelnuts, Shelled	Chest-nuts	Cashew Nuts	Nuts N.E.S.	Almonds, Shelled	Pine-apples	Pine-apples, Canned	Pineapple Juice, Single Strength	Fruits, Fresh, N.E.S.
Taiwan									
Argentina									
China		x			x				
Thailand							x	x	x
Honduras						x			
Costa Rica									
Colombia									
Ecuador									
Morocco									
Cuba									
Egypt									
Cyprus					x				
Brazil						x		x	
Belize									
Singapore			x	x			x		
Jamaica									
Chile				x					
Lebanon									
Turkey	x	x			x				x
Afghanistan									
Cyprus									
Saudi Arabia									
Iran									
Philippines						x	x	x	
Kenya							x	x	
Mexico									
Trinidad									
Pakistan									x
Venezuela									x
Iraq									
Tunisia									
Malaysia					x				
India									
Gaza Strip									
Jordan									
Côte d'Ivoire						x			
Martinique									
Peru									
Dominican Republic									
Hong Kong		x	x	x					
Korea, Republic of		x							
Sri Lanka									
Mozambique									
Tanzania			x						
Guinea-Bissau			x						
Kuwait				x					
					(percent)				
Share 1	2	72	91	50	5	87	87	50	43
Share 2	99	98	100	82	100	84	81	87	69

Source: Data on horticultural products compiled by the author from various FAO sources.
Notes: Share 1 is the share of developing countries in the world market. Share 2 is the share of the top four exporters in total developing-country exports. The fruits selected are those with world trade valued at US$50 million or more. Countries are listed in the order of their share of the world market in 1983-85. N.E.S. is "not elsewhere specified."

Table 46—Top four developing-country exporters of selected vegetables, value of world trade more than US$50 million, 1983-85

Country	Vegetables										
	Fresh N.E.S.	Canned N.E.S.	Prepared, N.E.S.	Frozen	Dehydrated	Temporarily Preserved	Tomatoes	Tomato Paste	Beans, Dry	Lentils	Pulses N.E.S.
Taiwan	x		x	x	x	x					
Mexico			x				x	x			
Hong Kong			x		x	x					
Morocco			x	x		x	x	x			
Turkey					x		x	x		x	
Jordan							x				
Thailand		x							x		x
Indonesia											
Costa Rica											
Dominican Republic											
Egypt				x	x						
Cyprus											
Lebanon											
Argentina									x		
China, People's Republic of	x	x							x		
Burma									x		
Korea, Republic of		x		x		x					
Brazil								x			
Venezuela	x										
Kenya	x										
Malaysia											x
Singapore		x								x	
India											
Sri Lanka											
Syria										x	
Chile										x	
Ethiopia											
Viet Nam											x
Pakistan											
						(percent)					
Share I	38	74	33	15	31	50	32	12	59	67	69
Share II	46	100	81	97	72	93	90	97	74	100	72

(continued)

Table 46—Continued

Country	Broad Beans	Chick-peas	Mushrooms			Potatoes	Onions, Dried	Garlic	Cucum-bers and Gherkins	Cabbages
			Fresh	Canned	Dried					
Taiwan			x		x					x
Mexico		x						x	x	
Hong Kong										
Morocco	x					x				
Turkey	x	x					x			
Jordan									x	
Thailand										
Indonesia										x
Costa Rica										
Dominican Republic						x	x			
Egypt						x			x	
Cyprus						x				
Lebanon								x		
Argentina										
China, People's Republic of	x		x	x				x		x
Burma										
Korea, Republic of			x	x	x					
Brazil										
Venezuela										
Kenya										
Malaysia										
Singapore		x		x	x		x	x		x
India							x			
Sri Lanka										
Syria		x								
Chile										
Ethiopia	x									
Viet Nam										
Pakistan					x					
						(percent)				
Share I	58	67	35	36	45	18	31	72	1	17
Share II	100	97	100	100	96	65	61	77	100	

Source: Data on horticultural products compiled by the author from various FAO sources.

Notes: Share 1 is the share of the top four exporters in total developing-country exports. Share 2 is the share of the top four exporters in total developing-country exports. The vegetables selected are those with world trade valued at US$50 million or more. Countries are listed in the order of their share of the world market in 1983-85. N.E.S. is "not elsewhere specified."

APPENDIX 2: METHODOLOGY

Constant Market Share Analysis

A discrete two-time period model of constant market share analysis is presented below. The notations used are as follows:

$i = 1, \ldots, I$ = subscript for import market i;
0 = superscript indicating the base period;
1 = superscript indicating the end of the observation period;
Δ = change in a variable between two periods;
q_i^0 = exports to market i during the base period;
Q_i^0 = imports in market i during the base period;
s_i^0 = market share in market i during the base period; $s_i^0 = q_i^0/Q_i^0$.
q^0 = exports to all markets during the base period;
Q^0 = imports in all markets during the base period;
S^0 = market share of all markets during the base period; $S^0 = q^0/Q^0$.

If
$$q_i^0 = s_i^0 Q_i^0 \quad \text{and} \tag{1a}$$
$$q_i^1 = s_i^1 Q_i^1, \tag{1b}$$

and
$$s_i^1 = s_i^0 + \Delta s_i \quad \text{and} \tag{2a}$$
$$Q_i^1 = Q_i^0 + \Delta Q_i, \tag{2b}$$

then
$$\Delta q_i = q_i^1 - q_i^0 = s_i^1 Q_i^1 - s_i^0 Q_i^0. \tag{3}$$

Using equations (2a) and (2b) in (3),

$$\Delta q_i = s_i^0 Q_i^0 + s_i^0 \Delta Q_i + \Delta s_i Q_i^0 + \Delta s_i \Delta Q_i - s_i^0 Q_i^0, \tag{4a}$$
$$= s_i^0 \Delta Q_i + \Delta s_i Q_i^1. \tag{4b}$$

This is the decomposition of the total change in export value of the commodity with respect to one import market i. Summing equation (4b) over all import markets, $i = 1, \ldots, I$, yields:

$$\Delta q = \sum_i \Delta q_i = \sum_i s_i^0 \Delta Q_i + \sum_i \Delta s_i Q_i^1 \tag{5}$$
$$= (S^0 \Delta Q) + (\sum_i s_i^0 \Delta Q_i - S^0 \Delta Q) + (\sum_i \Delta s_i Q_i^1) \tag{6}$$
$$= \begin{matrix}\text{IMPORT GROWTH} \\ \text{EFFECT}\end{matrix} + \begin{matrix}\text{MARKET} \\ \text{EFFECT}\end{matrix} + \begin{matrix}\text{COMPETITIVE} \\ \text{EFFECT.}\end{matrix}$$

The import growth effect is the potential change in total exports of a country assuming a constant (base period) market share.

The market effect is the difference between the overall import growth effect ($S^0\Delta Q$) and the sum of the market-specific growth effects ($\sum_i s_i^0 \Delta Q_i$).

The latter term is determined by the magnitude of s_i^0 or ΔQ_i. Hence, for equal absolute changes (ΔQ_i), an important region (large s_i^0) affects $\sum_i s_i^0 \Delta Q_i$ more than a less important import region (small s_i^0). Also, under the constant market share in the base period, the sign and magnitude of the absolute change (ΔQ_i) determine the importance of a region's contribution to the market effect. Therefore, the market effect is likely to be negative under unfavorable import demand conditions in the most important regions.

The competitive effect is the residual after subtracting the import growth effect and the market effect from total change in exports. The competitive effect takes the change in market shares (Δs_i) explicitly into consideration. The severity of a market share loss in an important market ($-\Delta s_i$) is proportional to the absolute size of the import market (Q_i^1).

Sources of Basic Data for Variables Used in Analysis of Factors Contributing to Differential Export Performance

Data sources are as follows:

RER (real exchange rate): A. Wood, *Global Trends in Real Exchange Rates, 1960 to 1984,* World Bank Discussion Paper 35, Washington, D.C.: World Bank, 1988, Appendix.

GDP (per capita real GDP): Nominal per capita GDP of each country in U.S. dollars was converted into domestic currency using the nominal official exchange rate and then deflated using the domestic CPI (1980 = 100) index. (All series were taken from World Bank, *World Tables,* various issues.)

Y (real income of exporting countries): International Monetary Fund, *International Financial Statistics,* various issues.

TDEP (openness of the economy): World Bank, *World Tables,* various issues.

LOAD (number of tons loaded in the ports of exporting countries): United Nations, *Statistical Yearbook,* various years.

EDU (the secondary school enrollment rate): World Bank, *World Tables,* various issues.

SMAN (the share of manufacturing goods in total exports): World Bank, *World Tables,* various issues.

PROD (the quantity of horticultural production): Food and Agriculture Organization of the United Nations, *FAO Production Yearbook,* Rome: FAO, various years.

Estimation of Elasticities

Empirical estimates of price elasticities of imports are not readily available for horticultural products. However, elasticities for broader levels of aggregation can give some idea about a more detailed line of items. In general, it is known that most of the import price elasticity estimates between products range between −0.5 and −1.5 for agricultural produce and between −0.75 and −2.75 for manufactured goods, while income elasticities tend to be higher (Stern, Francis, and Schumacher 1976). Where no estimates were available, Sarris (1983) assumed −0.5 for import elasticities and 2.0

for export elasticities. In the UNCTAD 1985 study, import demand elasticities for various horticultural products vary between −0.4 and −0.6.

Empirical estimates of import price elasticities are available for vegetable products (Cline et al. 1978, 58). Reported estimates are −0.90 for the United States, −0.47 for Japan, and −0.52 for the European Community.

Import demand and export supply elasticities can also be derived from the estimates of domestic demand and supply elasticities, the assumed share of imports in aggregate demand, and the share of exports in domestic production. Valdés and Zietz (1980) reported such estimates for selected horticultural commodities. Import demand elasticities estimated in that study ranged from −7.6 for potatoes to −0.4 for bananas, whereas the export supply elasticity estimates ranged from 8.9 for potatoes to 0.5 for grapes. Estimates obtained in this way tend to be high when the commodity is produced domestically because of assumed elasticity of substitution between the domestic and foreign markets. However, this latter assumption is not always true for all horticultural credits, especially if there is considerable production differentiation between domestic and export markets. Domestic price elasticities are also reported in a study by Hunt (1979).

Technical Description of the Simulation Model

The partial equilibrium simulation model is used in Chapter 5 to estimate the effects of a complete removal of tariffs and NTBs from major developed markets and the gains of developing countries.

The model employed is similar to those used by Zietz and Valdés (1986) and Laird and Yeats (1988). In these models, developing countries are expected to benefit from trade liberalization by combining two effects. First, the net exporting developing countries will gain from the increase in the world price resulting from trade liberalization, regardless of whether they increase their export quantity or not. Second, if developing countries have the capacity to increase exports readily in response to the world price increase, there is potential for an increase in the quantity of exports in developing countries.

Notations

P_j^0 = the preliberalization domestic price in the importing country j,

P_w^0 = the preliberalization world price,

E = the exchange rate,

t_j^0 = the preliberalization nominal protection coefficient in country j,

$\sim$ = percentage change,

m_j^0 = the preliberalization import in country j,

M = world imports,

x_i^0 = the preliberalization export from country i,

X = world exports,

e_j^m = the import demand elasticity in country j, and

e_i^x = the export supply elasticity in country i.

Model

In the preliberalization period, the domestic commodity price of country j (P_j^0) is related to the world market price (P_w^0) in the following way:

$$P_j^0 = P_w^0 E(1 + t_j^0).$$

Now, a tariff reduction by major developed countries is assumed to change each country's domestic price:

$$P_j^1 = P_w^1 E(1 + t_j^1),$$

where superscript 1 implies the postliberalization level of each variable. The exchange rate is assumed to be unaffected by the changes induced by trade liberalization.

Then, in final equilibrium, the percentage change in domestic price is

$$\tilde{P}_j = \Delta P_j / P_j^0 = (1 + \tilde{P}_w)\,[1 + \Delta t_j/(1 + t_j^0)] - 1.$$

Given the percentage change in the domestic price, the postliberalization level of imports is

$$m_j^1 = m_j^0(1 + e_j^m \tilde{P}_j)$$

or

$$\Delta m_j = m_j^0 e_j^m \tilde{P}_j.$$

Since it is assumed that tariffs are reduced simultaneously by all major developed markets, the total increase in world imports is

$$\begin{aligned}
\Delta M &= \sum_j \Delta m_j, \\
&= \sum_j m_j^0 e_j^m \tilde{P}_j, \\
&= \sum_j m_j^0 e_j^m \{(1 + \tilde{P}_w)\,[1 + \Delta t_j/(1 + t_j^0)] - 1\}, \\
&= \underbrace{\sum_j m_j^0 e_j^m\,[\Delta t_j/(1 + t_j^0)]}_{\text{increase in imports assuming } P_w = P_w^0} + \underbrace{\sum_j m_j^0 e_j^m \tilde{P}_w\,[1 + \Delta t_j/(1 + t_j^0)]}_{\text{reduction in imports by an increase in world prices}}.
\end{aligned}$$

Now consider the export supply side. An increase in export supply by an exporting country i is

$$\Delta x_i = x_i^0 e_i^x \tilde{P}_w,$$

where x_i^0 is the preliberalization amount of exports from country i to liberalized developed markets. In the case of the European Community, which exports almost 90 percent of its total horticultural exports to itself, the increase in exports from the liberalization scenario will be relatively small due to the CAP, which implies that exportation within the European Community already faces free entry.

Equilibrium in the world market is achieved if the following equation holds:[41]

$$\Delta m_{EC} + \Delta m_{Japan} + \Delta m_{USA} = \Delta x_{EC} + \Delta x_{Japan} + \Delta x_{USA} + \Delta x_{LDC}.$$

Since the share of the rest of the developed countries in the world trade of horticultural products is small, they are ignored in our simulation. The equilibrium equation can be rewritten as

$$\sum_j m_j^0 e_j^m [\Delta t_j/(1 + t_j^0)] + \tilde{P}_w \sum_j m_j^0 e_j^m [1 + \Delta t_j)(1 + t_j^0)] = \tilde{P}_w \sum_i x_i^0 e_i^x.$$

Then the equilibrium $\tilde{P}_w$ can be expressed as

$$\tilde{P}_w = \frac{\sum_j m_j^0 e_j^m [\Delta t_j/(1 + t_j^0)]}{\sum_i x_i^0 e_i^x - \sum_j m_j^0 e_j^m [1 + \Delta t_j/(1 + t_j^0)]}.$$

Substituting this expression for $\tilde{P}_w$ into Δm_j gives

$$\begin{aligned}\Delta m_j &= m_j^0 e_j^m [\Delta t_j/(1 + t_j^0)] + m_j^0 e_j^m \tilde{P}_w [1 + \Delta t_j/(1 + t_j^0)] \\ &= m_j^0 e_j^m [\Delta t_j/(1 + t_j^0)] \\ &\quad + \left[\frac{\sum_j m_j^0 e_j^m [\Delta t_j/(1 + t_j^0)]}{\sum_i x_i^0 e_i^x - \sum_j m_j^0 e_j^m [1 + \Delta t_j/(1 + t_j^0)]}\right] m_j^0 e_j^m [1 + \Delta t_j/(1 + t_j^0)].\end{aligned}$$

The expression for $\tilde{P}_w$ can be simplified by using weighted averages of e_j^m, e_i^x, and t_j:

$$\tilde{P}_w = \frac{e_w^m [\Delta t_w/(1 + t_w^0)] \sum_j m_j^0}{e_w^x \sum_i x_i^0 - e_w^m [1 + \Delta t_w/(1 + t_w^0)] \sum_j m_j^0}.$$

Since

$$\sum_j m_j^0 = \sum_i x_i^0,$$

$$\begin{aligned}\tilde{P}_w &= \frac{e_w^m [\Delta t_w/(1 + t_w^0)]}{e_w^x - e_w^m [(1 + \Delta t_w/(1 + t_w^0)]}, \\ &= \frac{[\Delta t_w/1 + t_w^0)]}{(e_w^x/e_w^m) - [1 + \Delta t_w/(1 + t_w^0)]},\end{aligned}$$

[41] In a new equilibrium, imports of developing countries will also adjust to a new world price. However, this change is abstracted from this analysis because it unnecessarily complicates the analysis.

where

$$e_m^x = \sum_i (x_i / \sum_i x_i) e_i^x,$$
$$e_w^m = \sum_j (m_j / \sum_j m_j) e_j^m, \text{ and}$$
$$t_w = \sum_j (m_j / \sum_j m_j) t_j.$$

Furthermore, if it is assumed that

$$e_j^m = e^m \text{ for all j},$$
$$e_i^x = e^x \text{ for all i, and}$$
$$t_j = t \text{ for all j},$$

$$\Delta m_j = m_j^0 e^m [\Delta t/(1 + t^0)] + \left(\frac{[\Delta t/(1 + t^0)]}{e^x/e^m - [1 + \Delta t/(1 + t^0)]} \right) m_j^0 e^m [1 + \Delta t/(1 + t^0)]$$

$$= m_j^0 e^m [\Delta t/(1 + t^0)] \left(1 + \frac{[1 + \Delta t/(1 + t^0)]}{e^x/e^m - [1 + \Delta t/(1 + t^0)]} \right)$$

$$= m_j^0 e^m [\Delta t/(1 + t^0)] \left(\frac{1}{1 - (e^m/e^x)[1 + \Delta t/(1 + t^0)]} \right).$$

This expression is similar to the one presented in Laird and Yeats (1988).

BIBLIOGRAPHY

Alvensleben, R. V. 1982. *The EEC agricultural policy and world trade with fruits and vegetables.* Hannover, Germany: Institute of Horticultural Economics.

Armbruster, W. A., and E. V. Jesse. 1983. Fruits and vegetables marketing orders. In *Federal marketing programs in agriculture: Issues and options,* ed. D. R. Armbruster, D. R. Henderson, and R. D. Knutson. Danville, Ill., U.S.A.: Interstate Printers and Publishers.

Asian Vegetable Research and Development Center. 1988. *Vegetables research in Southeast Asia.* Taipei, Taiwan: AVRDC.

Askari, H., and John T. Cummings. 1977. Estimating agricultural supply response with the Nerlove model: A survey. *International Economic Review* 18 (June): 257-292.

Bale, Malcolm D. 1986. *Horticultural trade of the expanded European Community: Implications for Mediterranean countries.* Washington D.C.: World Bank.

Behrman, Jere R. 1977. *International commodities agreements: An evaluation of the UNCTAD integrated commodities programme.* Washington, D.C.: Overseas Development Council.

Bond, Marian E. 1987. An econometric study of primary commodity exports from developing country regions to the world. *IMF Staff Papers* 34 (June): 191-227.

Braun, Joachim von, David Hotchkiss, and Maarten Immink. 1989. *Nontraditional export crops in Guatemala: Effects on production, income, and nutrition.* Research Report 73. Washington, D.C.: International Food Policy Research Institute.

Bredahl, M. E., J. S. Hillman, R. A. Rothenberg, and N. Gutierrez. 1983. *Technical change, protectionism, and market structure: The case of international trade in fresh winter vegetables.* Agricultural Experiment Station Bulletin 249. Tucson, Ariz., U.S.A.: University of Arizona.

Bredahl, M. E., A. Schmitz, and J. S. Hillman. 1987. Rent seeking in international trade: The great tomato war. *American Journal of Agricultural Economics* 69 (February): 1-10.

Buckley, Katherine C., J. V. VanSickle, M. E. Bredahl, E. Belibasis, and N. Gutierrez. 1986. *Florida and Mexico competition for the winter fresh vegetable market.* Economic Research Service Report 556. Washington, D.C.: U. S. Department of Agriculture.

Cline, William R., Noburo Kawanabe, T. O. M. Krousjö, and Thomas Williams. 1978. *Trade negotiations in the Tokyo Round: A quantitative assessment.* Washington, D.C.: The Brookings Institute.

Commonwealth Agricultural Bureau. 1980. Perspectives in world agriculture. London: CAB.

Cooper, R. 1987. Why trade liberalization meets resistance. In *The Uruguay round: A handbook on the multilateral trade negotiations,* ed. Michael J. Finger, and Andrzej Olechowski. Washington, D.C.: World Bank.

Daines, S., and G. Hargreaves. 1985. Fruit and vegetable export possibilities for El Salvador. U.S. Agency for International Development. Washington, D.C., pp. 5-19. Mimeo.

Diakosavvas, D., and C. Kirkpatrick. 1989. *Exchange rate policy and agricultural exports performance in sub-Saharan Africa.* New Series Discussion Paper No. 9. Bradford, West Yorkshire, England: Development and Project Planning Centre, University of Bradford.

FAO (Food and Agriculture Organization of the United Nations). 1985. *The world market for tropical horticultural products.* ESC/MISC./85.

_____. 1986. FAO trade yearbook tape, 1985. FAO, Rome.

_____. 1987a. Major aspects of U.S. import requirements for horticultural products. Paper prepared for the Economic Cooperation between Developing Countries Seminar on Tropical Horticultural Products in Latin America and Caribbean Region, Bogota. ECDC/ITT/MP/LA.

_____. 1987b. Prospects and development requirements for imports of tropical horticultural products in the U.S.A. Paper prepared for the Economic Cooperation between Developing Countries Seminar on Tropical Horticultural Products in Latin America and Caribbean Region, Bogota. ECDC/ITT/MP/LA.

_____. 1988a. Agriculture: Toward 2000 data tape. FAO, Rome.

_____. 1988b. *The world banana economy.* FAO Economic and Social Development Paper 57. Rome: FAO.

_____. 1989a. *Citrus juices.* FAO Economic and Social Development Paper 78. Rome: FAO.

_____. 1989b. Trends in and prospects for trade in tropical horticultural products. FAO, Rome.

_____. Various issues. *Commodity review and outlook.* Rome: FAO.

_____. Various years. FAO food balance sheets. Rome. Computer printout.

_____. Various years. *FAO production yearbook.* Rome: FAO.

GATT (General Agreement on Tariffs and Trade). 1988. Sanitary and phytosanitary regulations: Role and status of work of selected organizations. Geneva. Mimeo.

_____. 1989. *Focus.* GATT Newsletter: Uruguay Round Special Issue (May).

Goldstein, Morris, and Moshin S. Kahn. 1978. The supply and demand for exports: A simultaneous approach. *Review of Economics and Statistics* 60 (May): 275-286.

_____. 1985. Income and price effects in foreign trade. In *Handbook of international economics,* vol. 2. Ed. Ronald W. Jones and Peter B. Kenen. Amsterdam: North Holland.

Grossman, A. J. A. 1982. *Fruit and vegetable processing in a new international division of labour.* Occasional Paper No. 14. Tilburg, Netherlands: Development Research Institute, Tilburg University.

Guither, Harold D. 1987. *Agricultural trade between the United States and Canada.* Report AE4633. Urbana, Ill., U.S.A.: University of Illinois.

Hallam, David, and Juan Patricio Molina. 1988. *The UK market for fresh exotic fruits.* Bulletin No. 13. London: Overseas Development Administration, Natural Resources Institute.

Harrison, K., D. Henley, H. Riley, and J. Shaffer. 1974. *Improving food marketing systems in developing countries: Experiences from Latin America.* Research Report No. 6. Ann Arbor, Mich., U.S.A.: Latin American Studies Center, Michigan State University.

Hayami, Yujiro, Lourdes S. Adriano, and Ma. Agnes R. Quisumbing. 1988. *Agribusiness and agrarian reform: A view from the banana and pineapple plantations.* Working Paper No. 88-01. Los Baños: Center for Policy and Development Studies, University of the Philippines.

Hörmann, Dieter M. 1981. *Export oriented horticulture in developing countries-Kenya.* Working Paper No. 31. Hannover, Germany: Institute for Horticultural Economics.

Hörmann, Dieter M., and L. Wietor. 1980. *Export oriented horticulture in developing countries-Ivory Coast.* Working Paper No. 26, Hannover, Germany: Institute for Horticultural Economics.

Hörmann, Dieter M., and Margret Will. 1987. *The market for selected fresh tropical fruits from Kenya in Western European countries.* Working Paper No. 57. Hannover, Germany: Institute for Horticultural Economics.

Horton, T. S. 1987. Characteristics of horticultural export enterprises utilizing contract farming scheme in Senegal. Clark University, Worcester, Mass., U.S.A. Mimeo.

Hunt, R. D. 1979. *Fruit and vegetable exports from the Mediterranean area to the EEC.* World Bank Staff Working Paper No. 321. Washington, D.C.: World Bank.

International Monetary Fund. Various issues. *International Financial Statistics.*

Jaffee, Steven. 1986. The Kenyan horticultural export sector: An economic and institutional analysis of alternative marketing channels. Final Report for the U.S. Agency for International Development, St. Anthony's College, Oxford University, Oxford.

_____. 1987. *Case studies of contract farming in the horticultural sector of Kenya.* Working Paper No. 10. Worcester, Mass., U.S.A.: Institute for Development Anthropology, Clark University.

Iesse, E. V., and A. C. Johnson. 1981. *Effectiveness of federal marketing orders for fruits and vegetables.* AER 471. Washington, D.C.: U.S. Department of Agriculture, Economics and Statistics Service.

Joy, C. 1987. *Selected European markets for specialty and tropical fruits and vegetables.* London: Tropical Horticultural Development and Research Institute.

Keesing, Donald B. 1988. *The four successful exceptions.* UNDP-World Bank Trade Expansion Program Occasional Paper 2. Washington, D.C.: World Bank.

Koester, Ulrich, Hartwig Schafer, and Alberto Valdés. 1988. Demand-side constraints and structural adjustment in Sub-Saharan African countries. International Food Policy Research Institute, Washington, D.C. Mimeo.

Laird, Sam, and Alexander Yeats. 1988. *Quantitative methods for trade barrier analysis.* World Bank, Washington, D.C. Mimeo.

Mejia, Emil B. 1986. An examination of the feasibility of exporting Honduran fresh cucumbers to the United States winter market. M.S. thesis, University of Florida, Gainesville, Fla., U.S.A.

Menegay, Merle R. 1985. Improving the performance of procurement systems for fruit and vegetable processors in Thailand: A case study of up-country pickers and canneries. Ph.D. dissertation, Michigan State University, Ann Arbor, Mich., U.S.A.

Moulton, K. S., and D. Runsten. 1986. *The frozen vegetable industry of Mexico.* Berkeley, Calif., U.S.A.: University of California, Cooperative Extension.

Moulton, K. S., D. Runsten, R. Cook, J. Chalfant, and R. Amom. 1986. *Competitiveness at home and abroad: Marketing California specialty crops.* Davis, Calif., U.S.A.: Agricultural Issues Center, University of California.

Norgues, Julio J., A. J. Olechowski, and L. A. Winters. 1986. The Extent of nontariff barriers to industrial countries' imports. *World Bank Economic Review* 1: 181-199.

Normile, M. A., and C. A. Goodloe. 1988. *U.S.-Canadian agricultural trade issues: Implications for the bilateral trade agreement.* Washington, D.C.: Economic Research Service, U.S. Department of Agriculture.

Peters, Mark A. 1987. An analysis of the economic potential for export vegetable production in Jamaica. M.S. thesis, University of Florida, Gainesville, Fla. U.S.A.

Sarris, A. 1983. European Community enlargement and world trade in fruits and vegetables. *American Journal of Agricultural Economics* 65 (May): 235-246.

_____. 1984. *World trade in fruit and vegetables: Projections for an enlarged European Economic Community.* Washington, D.C.: Economic Research Service, U.S. Department of Agriculture.

Schermerhorn, R.W. 1986. A comparative analysis of fruit and vegetable marketing in developing countries. Postharvest Institute for Perishables, University of Idaho, Moscow, Idaho, U.S.A. Mimeo.

Schluter, Michael. 1984. *Constraints on Kenya's food and beverage exports.* Research Report 44. Washington, D.C.: International Food Policy Research Institute.

Shapiro, M. O., and S. Wainana. 1987. Kenya: A case study of the production and export of horticultural countries. World Bank, Washington, D.C. Mimeo.

Starnoulis, K., B. Wright, Y. Nishiyama, D. Pick, A. McCalla, and C. Carter. 1987. *Trade barriers and macroeconomic factors affecting exports of California specialty crops.* Davis, Calif., U.S.A.: Agricultural Issues Center, University of California.

Stern, Robert, J. Francis, and Bruce Schumacher. 1976. *Price elasticities in international trade.* London: Macmillan.

Stevens, C., and J. V. Themat. 1987. *EEC and Third World: A survey of 1987.* London: Hodder and Sloughton.

United Nations. 1987. Trade data tape. New York.

_____. Various years. *Statistical yearbook.* New York: UN.

United Nations Centre on Transnational Corporations. 1981. *Transnational corporations in food and beverage processing.* New York: United Nations.

UNCTAD (United Nations Conference on Trade and Development). 1974. *Survey of commodities demand and supply elasticities.* Research Memorandum 48. UNCTAD/RD/70.

_____. 1983a. *Agricultural trade expansion and protectionism, with special reference to products of export interest to the developing countries.* Report No. TD/B/C.1/239.

_____. 1983b. *Protectionism and structural adjustment in agriculture.* Report No. TD/B/939.

_____. 1984. *Trade and development report.* Geneva: UNCTAD.

_____. 1985. *Trade and development report.* Geneva: UNCTAD.

_____. 1988. *Uruguay round: Papers on selected issues.* Geneva: UNCTAD.

USDA (U.S. Department of Agriculture). 1987. *Trade policies and market opportunities for U.S. farm exports: Annual report.* Washington, D.C.: USDA.

_____. 1988. Caribbean Basin initiative. *Horticutural Products Review* (May): 3-11.

Valdés, Alberto, and Joachim Zietz. 1980. *Agricultural protection in OECD countries: Its cost to less-developed countries.* Research Report 21, Washington, D.C.: International Food Policy Research Institute.

Villareal, Ruben L. 1980. *Tomatoes in the tropics.* Boulder, Colo., U.S.A.: Westview Press.

Wood, A. 1988. *Global trends in real exchange rates, 1960 to 1984.* World Bank Discussion Paper 35. Washington, D.C.: World Bank.

World Bank. 1988. *Commodity trade and price trends.* Washington, D.C.: World Bank.

_____. Various years. *World development report.* New York: Oxford University Press for the World Bank.

_____. Various issues. *World tables.* Washington, D.C.: World Bank.

Yeats, Alexander. 1987. The escalation of trade barriers. In *The Uruguay round: A handbook on the multilateral trade negotiations,* ed. Michael J. Finger and Andrzej Olechowski. Washington, D.C.: World Bank.

York, G., G. Mitchell, M. Cantwell, D. Hsieh, and D. Jolly. 1987. *Food quality and safety: Impacts on marketability.* Davis, Calif., U.S.A.: Agricultural Issues Center, University of California.

Zietz, Joachim, and Alberto Valdés. 1986. *The costs of protectionism to developing countries: An analysis for selected agricultural products.* World Bank Staff Working Papers No. 769. Washington, D.C.: World Bank.

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