United States International Trade Commission

Conditions of Competition for Certain Oranges and Lemons in the U.S. Fresh Market

Investigation No. 332-469
USITC Publication 3863
July 2006

U.S. International Trade Commission

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Address all communications to
Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

U.S. International Trade Commission

Washington, DC 20436
www.usitc.gov

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Publication 3863 **July 2006**

This report was prepared principally by

Office of Industries

Joanna Bonarriva, *Project Leader*
Renee Johnson and George Serletis, *Deputy Project Leaders*

Daniel Cook, Roger Corey, Alfred Dennis, Timothy McCarty, Douglas Newman, and Judith-Anne Webster

Primary Reviewer
James Stamps

Office of Economics
Justino de la Cruz

Administrative Support
Phyllis Boone and Janice Wayne

Under the direction of
William Lipovsky, *Acting Chief*
Agriculture and Fisheries Division

CONTENTS

Page

CONTENTS—*Continued*

Page

Chapter 3: Competitive Conditions in Fresh Market Orange and Lemon Production—*Continued*

Chapter 4: United States 4-1

CONTENTS—*Continued*

CONTENTS—*Continued*

Page

Chapter 6: Australia—*Continued*

Chapter 7: Chile

CONTENTS—*Continued*

Page

Chapter 7: Chile—*Continued*

CONTENTS—*Continued*

Page

Chapter 8: People's Republic of China—*Continued*

Chapter 9: Mexico 9-1

CONTENTS—*Continued*

Page

CONTENTS—*Continued*

Page

Chapter 11: Spain—*Continued*

Bibliography

Appendixes

Figures

CONTENTS—*Continued*

Page

Figures—*Continued*

Tables

CONTENTS—*Continued*

Page

Tables—*Continued*

CONTENTS—*Continued*

Page

Tables—*Continued*

Page

Tables—*Continued*

Executive Summary

The competitive environment in the global market for fresh oranges and lemons has changed significantly in recent years. A variety of factors have contributed to an increasingly competitive situation faced by the U.S. industry with respect to major foreign suppliers. Demand for fresh oranges and lemons in developed markets has leveled off with a shift toward processed products, while consumption in developing markets is increasing as incomes rise. As a result, several large producing countries have begun to export in greater volumes, and several current citrus suppliers have recently developed fresh orange and/or lemon industries. Many of the new exporting countries are low-cost producers and increasingly supply high quality oranges and lemons that compete directly with traditional suppliers. In addition, they generally have low domestic consumption of fresh oranges and lemons, so that any increases in production are most likely destined for export. At the same time, sanitary and phytosanitary (SPS) conditions keep some country or regional suppliers out of certain markets until inter-country protocols can be established and met. Some suppliers face considerable obstacles to achieving SPS standards in certain markets.

This report responds to a request from the United States House of Representatives Committee on Ways and Means (Committee) to provide information on the competitive conditions in certain U.S. citrus industry sectors,[1] particularly the fresh market for oranges and lemons during 2000-2005. The seven countries profiled in this report, Argentina, Australia, Chile, China, Mexico, South Africa, and Spain, were identified as those that compete with U.S. producers of oranges, lemons, or both in the U.S. market and abroad.

In some foreign markets, the U.S. share of orange and lemon exports has declined since 2000 as the orange and lemon export shares of competitors have increased. Navel oranges, generally the preferred variety of fresh orange, are shipped to the United States in the late summer and fall from Australia and South Africa before the U.S. new crop is available. U.S. orange production competes with exports from Chile, South Africa, and Australia in major overseas markets, especially in important Asian markets such as Japan.[2] Chinese orange production, although exported in relatively small volumes, competes with U.S. oranges that are exported to China. Although U.S. lemons are grown year-round, Chile and Mexico increasingly supply the U.S. market, often shipping during narrow windows just before U.S. new-crop production is available. U.S. lemon production also competes with exports from Chile, South Africa, and Argentina in major foreign markets. Spanish exports of both oranges and lemons supply mainly the EU-25 market, to which the U.S. exports very little, owing to high duties.

Factors such as production volume, area, and yields can be used as a starting point to consider an industry's strengths and weaknesses. Not all large volume producers are important exporters, while some smaller volume producers export significant proportions of their production. Table ES-1 provides a summary of key industry statistics for the fresh

[1] On July 5, 2005, the Committee requested that the U.S. International Trade Commission (Commission) prepare a report under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)). A copy of the request letter is included in app. A, and the Commission's notice of investigation, published in the *Federal Register* of Aug. 8, 2005 (70 FR 45745), is in app. B.

[2] Although, generally, Northern and Southern Hemisphere exporters ship oranges and lemons in opposite growing seasons, the end of a season in one hemisphere can overlap with the beginning of another. Often this is a function of the use of cold storage to extend the marketing season.

Table ES-1 Fresh oranges and lemons: Industry comparison, selected countries, average annual 2002-04

Product	Factor	U.S.[a]	Argentina	Australia[b]	Chile	China	Mexico	South Africa	Spain
Oranges	Total hectarage (1,000 ha)	[c]336	61	[d]24	8	453	348	36	141
	Production volume (1,000 mt)	10,139 (total) 2,043 (fresh)	740	498	120	3,962	3,950	1,176	2,902
	Production volume (1,000 mt) Navels	1,275	37	243	90	[e]2,200	17	445	1,780
	Harvested yield[f] (mt/ha)	33	13	22	16	9	9	44	23
	Exports (1,000 mt)	538	107	113	11	21	13	720	1,538
	Export-to-production ratio (%)	26	14	24	9	0.5	([g])	[h]76	52
	Imports (1,000 mt)	60	([i])	10	([i])	52	28	7	140
	Import-to-consumption ratio (%)	4	([g])	8	([g])	1	1	3	1
Lemons	Total hectarage (1,000 ha)	27	45	1	7	[e]9	2	5	46
	Production volume (1,000 mt)	798	1,190	32	150	[e]100	12	185	951
	Harvested yield[f] (mt/ha)	33	27	32	22	[e]9	7	69	21
	Exports (1,000 mt)	100	308	3	30	([i])	5	109	539
	Export-to-production ratio (%)	14	27	8	20	([g])	42	[h]61	55
	Imports (1,000 mt)	34	([i])	3	([i])	5	1	([i])	47
	Import-to-consumption ratio (%)	5	([g])	8	([g])	5	25	([g])	10

Source: Compiled by Commission staff.

[a]Except where indicated, U.S. data are for oranges grown for the fresh market.
[b]Data for Australian lemons include both lemons and limes.
[c]Data represent total orange hectarage, including oranges grown for the fresh and processing markets.
[d]Data is for bearing hectarage only.
[e]Chinese navel and lemon volume and lemon area and yield are 2005 estimates.
[f]Harvested yields are calculated as total volume of production per bearing hectarage.
[g]Less than 0.5 percent.
[h]Ratio calculated from volume of fresh production only.
[i]Less than 500 mt.

market orange and lemon industries in the United States and its principal competitor countries.

U.S. fresh market orange and lemon production is large-scale and efficient by world standards, using the latest technology, research, and development.[3] Historically, U.S. growers have enjoyed a dominant position among world orange and lemon growers. However, producers in other countries are now able to meet U.S. quality at the same or even lower costs of production. U.S. growers report high and rising production costs, attributable to general competition in the U.S. agriculture sectors for key inputs, such as land, water, and chemicals. The high cost and regional scarcity of labor are also important factors limiting the ability of U.S. growers to lower overall costs. Rising costs can also be attributed to changing regulations regarding labor and environmental protections, restrictions on land and water use, increasing energy costs, and multiplying domestic and international food safety standards.

The Commission considered certain factors in evaluating the performance of the selected fresh orange and lemon industries: natural resource endowments; technology; access to capital, land, and labor; scale of production; productivity/yields; seasonality; business climate and investment; government support; exchange rates; regulations; market standards; and production costs. In a qualitative discussion of these factors, the Commission finds that favorable conditions for any one factor or group of factors do not necessarily result in higher relative performance or lower relative costs overall. Table ES-2 provides a summary of the of strengths and weaknesses of the U.S. and its principal foreign competitor countries' fresh orange and lemon industries.

This report employs different metrics, including input production costs, average unit values of traded products, international market shares, and revealed comparative advantage, to make a quantitative assessment of the fresh orange and lemon industries. Although these metrics may not provide consistent assessments, the use of multiple tools provides a comprehensive view of the global competitive situation.

The analysis of input costs of production across countries is a key component to determining industries' relative strengths and weaknesses; however, the Commission's cost analysis reveals that data complications prohibit true comparisons across countries. The methodological considerations for international cost comparisons, documented in the economic literature and summarized in the Commission's report, are complex. Data and practical complications have not been overcome in this study, and information presented should not be used for purposes of making strict cost comparisons among countries. Despite these limitations, cost data appear to indicate low relative farm-level costs per unit in Argentina, Mexico, and China for oranges and Argentina and Mexico for lemons. Cost data appear to indicate high relative farm-level costs per unit in Chile, Spain, and the United States for oranges and Chile and Spain for lemons. Incomplete data preclude a comparison of total costs including packing costs for all eight countries (tables ES-3 and ES-4).

Average unit values (AUVs) of exports calculated from international trade data (tables ES-5 and ES-6) are presented as another indicator of producer costs. Export AUVs should, to some extent, reflect production costs given that export AUVs comprise the production and

[3] The majority of oranges and lemons for the fresh market are grown in California and Arizona. Florida oranges are mainly processed into juice.

Table ES-2 U.S. and foreign competitor orange and lemon industries' strengths and weaknesses, by country

United States	General	• Major producer, importer, and exporter of fresh oranges and lemons. • Fresh exports are an important component of U.S. industry revenues.
	Strengths	• Production is large-scale and efficient by world standards with orchard management practices that optimize fruit quality and yields. • The majority of U.S. production is marketed through a voluntary cooperative system, which allows the industries to control supply movement to obtain strong prices and ensure the availability of stocks. • U.S. production enjoys strong brand recognition domestically and abroad and is known for its high quality. • Due to regional production variations and cold storage, U.S. lemons are available year-round.
	Weaknesses	• The U.S. industry faces high input costs, particularly labor and chemical costs, relative to foreign competitors. • Orange and lemon production competes with other horticulture crops for scarce workers. • Urbanization pressures in California and Arizona raise opportunity costs for producers. • Lemon production in Arizona is limited by the harsh climate that results in lower relative yields, and low grower returns for lemons due to increased competition/oversupply from domestic production and imports. • Counterseasonal navel imports have reduced market share for U.S. summer Valencia orange production.
Argentina	General	• Major global producer and exporter of oranges and lemons. • The bulk of lemon production is for processing, mainly for export. • Argentine fresh orange and lemon industries are focusing on increasing exports in the coming years.
	Strengths	• Labor costs are low and availability of labor is high relative to many competitors. • Southern Hemisphere location provides a seasonal advantage in major Northern Hemisphere markets. • Export firms tend to be relatively large-scale and vertically integrated, providing production and marketing efficiencies. • Currency exchange rates have been favorable to the industry, as most citrus trade is denominated in U.S. dollars or is converted into dollar terms.
	Weaknesses	• Relative distance from major export markets. The primary lemon production region is located inland at a significant distance from port facilities. • Subtropical climate fosters fungi and certain diseases, increasing cultivation costs, lowering yields, and interrupting exports (due to SPS restrictions) to certain important markets, such as the United States.
Australia	General	• Small global producer of oranges, negligible producer of lemons. • Second largest Southern Hemisphere net exporter of oranges. • Orange production shifting out of oranges for processing to fresh market production, principally navel varieties. • Orange packers are concentrated, highly automated and large scale.
	Strengths	• Low incidence of pests and diseases. • Use of advanced growing and packing technologies results in increased proportions of high quality fruit. • Multiple varieties allow for a 9 month marketing season. • Position in the Southern Hemisphere provides a seasonal advantage in major Northern Hemisphere markets, particularly Asia.
	Weaknesses	• High packing costs due to high labor costs. • Shortage of skilled and semi-skilled labor for orchard management, harvesting, and packing houses. • Limited water resources on the world's driest inhabited continent. • Salinity of water raises irrigation management costs.

Table ES-2—***Continued*** U.S. and foreign competitor orange and lemon industries' strengths and weaknesses, by country

Chile	General	• Minor producer and exporter of oranges and lemons. • The bulk of production is destined for the domestic market, but exports have been growing.
	Strengths	• Labor costs are low and availability of labor is high relative to many competitors. • The citrus industry has taken advantage of existing export infrastructure and marketing channels for other fruit. • Position in the Southern Hemisphere provides a seasonal advantage in major Northern Hemisphere markets. • Export firms tend to be relatively large-scale and vertically and horizontally integrated, providing production and marketing efficiencies. • Currency exchange rates have been favorable to the industry, as most citrus trade is denominated in U.S. dollars or is converted into dollar terms.
	Weaknesses	• The U.S. orange market is currently unavailable to Chile due to phytosanitary restrictions. • Relative distance from export markets. Pacific coast location is a disadvantage in EU markets compared with other Southern Hemisphere competitors. • The topography and microclimates in Chile contribute to scattered and relatively small individual production areas, likely increasing production costs.
China	General	• Major producer and net exporter of citrus, but mostly mandarins. • Orange and lemon production accounts for about one-third of all citrus production. Navels account for about one-half of orange production.
	Strengths	• Low farm-level cost of production, mostly due to abundant and low-cost labor. • Recent improvements in production practices, extension of growing seasons, and modernization of a few large packing facilities. • Increased use of production contracts and marketing agreements, including franchise agreements with a foreign-owned entity. • Some production has been promoted by national and local government initiatives including increased investment and technical assistance. • Proximity to southeast Asian import markets and duty-free trade under a free trade agreement with ASEAN.
	Weaknesses	• Majority of production is from small-scale, low-technology operations. • Scarcity of arable land limits production expansion and increases competition for land uses. • Poor post-harvest technologies and handling, inadequate infrastructure, low-level commercialization and integration, and out-dated commercial treatment and packaging characterize the majority of the industry. • High marketing costs and high fruit spoilage rates. • Exports are limited by difficulty meeting import and SPS requirements.
Mexico	General	• Major producer of oranges, but the vast majority for the domestic market. • Minor producer of lemons, mainly for industrial processing.
	Strengths	• The majority of lemon production grown under fixed-price contracts for a foreign-owned beverage manufacturer. • Lemon growers use the latest technology and practices to optimize fruit quality and yields.
	Weaknesses	• The presence of fruit-fly and a fumigation requirement limit most exports of oranges to the United States. • Production in certain regions tends to be small in scale and on government-owned plots. • Lack of access to capital hampers modernization and efficiency. • Fruit-fly free growing regions have suffered drought for the past 10 years.

Table ES-2—***Continued*** U.S. and foreign competitor orange and lemon industries' strengths and weaknesses, by country

South Africa	General	• Major exporter of citrus, mainly oranges and grapefruit and, to a lesser degree, lemons. Approximately 60 to 70 percent of citrus production is exported. • Majority of production takes place on large-scale, efficient operations that make use of the latest technology and research.
	Strengths	• Deregulation of the industry in the mid-1990s led to higher levels of investment and modernization to meet international standards, increasing overall competitiveness. • Low labor costs relative to many competitors. • Well-organized export industry known for a high quality product.
	Weaknesses	• Limited water supply and large fluctuations in precipitation limit expansion of production areas. • Land reform policies and empowerment programs add to complexity of ownership and labor issues. • Some shortage of labor and low productivity. • Shortage of refrigerated shipping vessels and resultant high costs. • Strong currency relative to the dollar has reduced grower returns in dollar denominated markets.
Spain	General	• Major producer, importer, and exporter of oranges and lemons. • Leading exporter of both lemons and navel oranges, the vast majority to EU countries, predominantly France and Germany.
	Strengths	• Proximity to key markets in EU that have a preference for Spanish fruit and no tariffs or import restrictions. • Government support through the EC's fruit and vegetable support program, which provides direct payments to citrus producers for market withdrawals, subsidies for processing, export refunds, and other forms of support. Other support and benefits to citrus growers are through the EC's rural development program, which encourages land to remain in farming.
	Weaknesses	• Small farm size does not benefit from economies of scale. • Lack of water and significant drought periods. • High input costs of production, particularly labor due to shortage of supply. • Prevalence of Mediterranean fruit fly restricts exports to US market. • High tree densities boost yields per hectare, but prohibit mechanization of pruning and harvest.

Source: Compiled by Commission staff.

Table ES-3 Oranges: Cost comparison by input or activity, by producing country

Cost item	U.S. 2005	Argentina 2005	Australia[a] 2002	Chile 2005	China 2004	Mexico 2005	S. Africa 2005	Spain[a] 2003
	Dollars (per hectare)							
Farm-level costs:	4,360	1,570	3,390-4,610	6,400	3,310	1,300	4,180	2,680-4,410
Labor[b]	[c]1,740	520	1,870-1,970	[d]4,480	1,140	780	1,120	830-1,370
Chemicals[e]	[c]1,120	530	630-700	na	1,650	100	780	610-1,160
Other economic costs[f]	na	na	na	na	840	na	na	na
	Dollars (per metric ton)							
Farm-level costs	153	51	129-132	160	115	65	139	117-147
Packing costs	191	164	[g]268	194	na	100	192	na
Harvesting costs	62	73	([h])	([h])	([h])	40	([h])	([h])
Other post-harvest costs[i]	[j]164	132	na	na	na	56	175	na
Total costs	570	421	[k]na	354	na	261	505	na

Sources: Compiled by Commission staff from a wide range of country-specific sources (described in Table 3-4). More detailed source information by country is provided in the country profiles (chapters 4-11). Farm-level costs are round to nearest tens. Totals may not add due to rounding. “na” indicates data are not available.

Notes: Due to the limitations of the cost data, these costs should be regarded as illustrative only and should not be used for purposes of making direct cost comparisons.

[a]Cost ranges reflect different growing regions in Australia and different production systems in Spain. For Australia, farm-level costs include both direct and indirect costs converted to a dollar/hectare basis.

[b]Labor costs are not always itemized, but are included as part of the overall costs for tasks such as pruning, orchard practices, or chemical applications. Some labor cost data likely include labor for fruit harvesting (e.g., Australia, Chile, China, South Africa, and Spain); while other cost data do not (e.g., United States, Argentina, Mexico).

[c]Estimated by Commission staff.

[d]Reported labor costs are high compared to those reported for other countries and may include other labor costs such as management labor and/or labor for other aspects of production, including harvesting.

[e]Chemical costs include fertilizers, pesticides/insecticides, herbicides, fungicides, growth regulators, and other chemical inputs, and may include application costs.

[f]Represents Chinese owner-operator labor.

[g]Packing costs are based on reported average orange packing costs during 1997-1998.

[h]Harvesting is likely included as part of farm-level costs.

[i]May include marketing and export costs, inspection fees, handling charges, and overhead costs, depending on the available cost information.

[j]Includes some overhead expenses not attributed specifically attributed to either growing or packing.

[k]Cannot be summed due to difference in data sets.

Table ES-4 Lemons: Cost comparison by input or activity, by producing country

Cost item	U.S. 2005	Argentina 2005	Australia 2002	Chile 2005	China 2004	Mexico 2005	S. Africa 2005	Spain 2003
	Dollars (per hectare)							
Farm-level costs:	4,520	1,935	[a]3,150	8,600	na	1,400	na	5,760
Labor[b]	[c]1,980	377	1,640	2,000	na	350	na	1,610
Chemicals[d]	[c]990	743	1,130	2,000	na	800	na	1,410
Other economic costs[e]	na	na	na	na	na	na	na	1,290
	Dollars (per metric ton)							
Farm-level costs	116	40	126	143	na	56	na	165
Packing costs	261	na	na	203	na	222	na	[f]224
Harvesting costs	145	44	([g])	([g])	na	60	na	[f]118
Other post-harvest costs	[h]121	[i]75	na	na	na	na	na	na
Total costs	643	na	na	347	na	338	na	na

Sources: Compiled by Commission staff from a wide range of country-specific sources (described in Table 3-4). More detailed source information by country is provided in the country profiles (chapters 4-11). Farm-level costs are round to nearest tens. Totals may not add due to rounding. “na” indicates data are not available.

Notes: Due to the limitations of the cost data, these costs should be regarded as illustrative only and should not be used for purposes of making direct cost comparisons.

[a]Includes both reported direct and indirect costs, converted to a dollar/hectare basis.
[b]Labor costs are not always itemized, but are included as part of the overall costs for tasks such as pruning, orchard practices, or chemical applications. Some farm cost data likely include labor for fruit harvesting (e.g., Australia, Chile, China, South Africa, and Spain); while other cost data do not (e.g., United States, Argentina, Mexico).
[c]Estimated by Commission staff.
[d]Chemical costs include fertilizers, pesticides/insecticides, herbicides, fungicides, growth regulators, and other chemical inputs, and may include application costs.
[e]Includes Spain’s farm opportunity cost based on land rent and interest costs.
[f]Harvesting and packing costs are based on more recently reported average lemon data from 2004-05.
[g]Harvesting is likely included as part of farm-level costs.
[h]Includes some overhead expenses not attributed specifically to either growing or packing.
[i]May include marketing and export costs, handling charges, and overhead costs, depending on the available cost information.

Table ES-5 Fresh oranges: Average unit values of exports (FOB), by country, 2000-2005, (dollars/mt)

Reporting country	2000	2001	2002	2003	2004	2005
Spain	421	484	539	666	763	781
Australia	574	568	608	745	791	741
United States	544	581	590	541	611	658
Chile	515	562	549	569	563	560
China	162	155	386	367	362	335
Argentina	373	379	207	288	311	275
Mexico	369	252	273	233	228	253
South Africa	243	204	197	303	381	195

Source: Global Trade Atlas.

Table ES-6 Fresh lemons/limes: Average unit values of exports (FOB), by country, 2000-2005, (dollars/mt)

Reporting country	2000	2001	2002	2003	2004	2005
China	804	370	366	261	382	948
Australia	750	757	832	947	895	817
United States	679	663	785	748	715	780
Spain	492	478	500	643	668	778
Chile	754	722	739	630	570	548
Mexico	278	443	227	352	502	500
Argentina	461	445	326	388	406	403
South Africa	323	269	245	370	488	177

Source: Global Trade Atlas.

other costs incurred by the exporter and the rate of return earned by the exporter. However, exporters' rates of return can and do vary widely in response to supply and demand conditions and other factors. In these cases, export AUVs may not accurately reflect producer costs. These export AUV data corroborate some and contradict some of the findings with respect to the production costs compiled for this report. While an analysis of AUVs of traded oranges and lemons at port of export show Mexico and Argentina at the low end of the value spectrum in 2005, consistent with production cost findings, Australia had the second highest export AUVs for both oranges and lemons, behind Spain and China respectively. Analysis of import AUVs in destination markets (which present a closer approximation of relative total producer costs since they should reflect all production, marketing, and transportation costs, is complicated by variations in producer AUVs by market, and a limited number of suppliers competing in any one destination market. For oranges, in the EU market where five of the eight selected countries compete, Argentina and South Africa were the lowest cost suppliers in 2005. For lemons, in the Japanese market, South Africa was the lowest cost supplier and the United States was the highest cost supplier.

The Commission's report provides an analysis of the relationship between each industry's producer costs (export AUVs) and its revealed comparative advantage. Some of the data are counterintuitive regarding production costs and export performance. For some countries, such as China and Mexico, low unit values correspond to low revealed comparative advantage, while for some countries, such as Australia (for oranges only) and Spain, relatively high unit values correspond to high revealed comparative advantage. This information further indicates that other factors, such as product quality, variety, timing, and demand in export markets, are important performance determinants for the fresh orange and lemon industries.

Abbreviations and Acronyms

AAEA	American Agricultural Economics Association
ABARE	Australian Bureau of Agricultural and Resource Economics
ACG	Australian Citrus Growers
APHIS	Animal and Plant Health Inspection Service
AQIS	Australian Quarantine and Inspection Service
AQSIQ	Administration for Quality Supervision Inspection and Quarantine of China
ASEAN	Association of Southeast Asian Nations
ASOEX	Asociación de Exportadores de Chile A.G.
AUV	average unit value
AVE	ad valorem equivalent
BEE	Black Empowerment Entitlement Act
CALGA	California-Arizona Lemon Growers Association
CAP	Common Agriculture Policy
CCGA	California Citrus Growers Association
CDFA	California Department of Food and Agriculture
CEFEA	Centro de Investigación y Especializacion en Gestión de Empresas Agroalimentarias
CFBF	California Farm Bureau Federation
CGA	Citrus Growers Association
CIA	Central Intelligence Agency
CIF	cost, insurance, freight
CIREN	Centro de Información de Recursos Naturales
CMDP	Citrus Market Development Program
CMO	Common Market Organization
CRI	Citrus Research Institute
CSA	Citrus South Africa
CSREES	Cooperative State Research, Education and Extension Service of USDA
DINIFAP	Research Division of Mexican Ministry of Agriculture
DFPT	Deciduous Fresh Produce Trust
EAGGF	European Agricultural Guarantee and Guidance Fund
EC	European Commission
EPA	Environmental Protection Agency
ERS	Economic Research Service (USDA)
EU	European Union
EurepGAP	Euro-Retailer Produce Working Group for Good Agricultural Practices
FAO	The United Nations Food and Agriculture Organization
FAOSTAT	The United Nations Food and Agriculture Organization Statistical Database
FAS	Foreign Agricultural Service (USDA)
Fecier	Federación del Citrus de Entre Ríos
Federcitrus	Federación Argentina del Citrus
FCOJ	frozen concentrated orange juice
FDF	Fundación para el Desarrollo Frutícola
FIRB	Foreign Investment Review Board of Australia
fob	free on board

Abbreviations and Acronyms—*Continued*

FOCIR	Fund for the Investment and Capitalization of the Rural Sector
FOMAGRO	Shared Risk Fund for Agribusiness Support
FRW	Fuller's Rose Weevil
FTA	free trade agreement
GAO	Government Accountability Office
GAP	Good Agricultural Practices
GMP	Good Managerial Practices
GTA	Global Trade Atlas database
HACCP	Hazard Analysis and Critical Control Point
HAL	Horticulture Australia Limited
HTS	Harmonized Tariff System
IFC	International Finance Corporation
ILO	International Labour Organization
INDAP	Institute of Farming Development (Chile)
INTA	Instituto Nacional de Tecnologia Agropecuaria
IPM	integrated pest management
IVIA	Instituto Valenciano de Investigaciones Agrarias
kg	kilogram
LBAM	light brown apple moth
MAPA	Ministry of Agriculture (Spain)
MFC	Mildura Fruit Company
MFN	most favored nation
MIA	Murrumbidgee Irrigation Area
MOA	Ministry of Agriculture (China)
MRL	maximum residue level
mt	metric ton
mmt	million metric ton
NAFTA	North American Free Trade Agreement
NCC	National Citrus Committee
NDA	National Department of Agriculture
NDPC	National Development and Reform Commission (China)
NFCOJ	not from concentrate orange juice
NSW	New South Wales
NTBs	non-tariff barriers
ODEPA	Oficina de Estudios y Políticas Agrarias (Chile)
OECD	Organization for Economic Cooperation and Development
POs	Producer Organizations
PPECB	Perishable Produce Export Control Board
PRC	People's Republic of China
PSD	Production, Supply, and Demand
PSE	producer subsidy equivalent
RCCs	rural credit co-operations
SAGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (Mexico)
SAGI	South African Geomatics Institute
SAGPYA	Secretaría de Agricultura, Ganadería, Pesca y Alimentos

Abbreviations and Acronyms—*Continued*

SENASA	Servicio Nacional de Sanidad y Calidad Agroalimentaria
SIACON	Sistema de Información Agropecuaria de Consulta
SOE	state owned enterprises
SPS	sanitary and phytosanitary
SRCA	symmetric revealed comparative advantage
U.A.E.	United Arab Emirates
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Education, Scientific and Cultural Organization
U.S.	United States
USDA	U.S. Department of Agriculture
USDOC	U.S. Department of Commerce
USITC	United States International Trade Commission
USTR	United States Trade Representative
VAT	value-added tax
VMOA	Valencia's Ministry of Agriculture (Spain)
WGA	Western Growers Association
WTO	World Trade Organization

CHAPTER 1
Introduction

Purpose

In response to a request by the House Committee on Ways and Means,[1] this report examines the factors affecting trade and production of fresh orange and lemon industries. It profiles the industries in the United States and seven other countries, Argentina, Australia, Chile, China, Mexico, South Africa, and Spain, compares their strengths and weaknesses, and assesses the prevailing conditions of competition, including production costs in each of the countries. The analysis in this report employs quantitative assessments based on key industry statistics such as international market share, price competitiveness, and revealed comparative advantage, as well as qualitative assessments of conditions of competition affecting the industries based on industry interviews and other sources. An important feature of this report is the discussion illuminating the difficulties of comparing factor costs for agricultural production.

Product and Industry Coverage

This report focuses primarily on sweet oranges, particularly navels, and lemons consumed in the fresh state.[2] The most common freshly consumed oranges are of the category called sweet oranges (*Citrus sinensis),* which includes round orange varieties such as Valencias and navel oranges. In many countries, including the United States, the same industries that produce sweet oranges also produce other citrus such as fresh grapefruit, tangerines, and orange/tangerine hybrids;[3] however, for the most part information on those fruits is not presented in this report. Of fresh sweet oranges, the U.S. industry produces mainly navels and, to a lesser extent, Valencias.

Approach

This report assesses competitive conditions faced by the U.S. fresh orange and lemon industries, and compares them with conditions faced by selected foreign industries that compete with the United States in the U.S. market and globally. Foreign countries selected

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[1] On July 5, 2005, the Committee on Ways and Means (Committee) requested that the U.S. International Trade Commission (Commission) prepare a report under section 332 (g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) that provides information on the conditions of competition affecting U.S. production and trade in the fresh market for oranges and lemons during the period 2000-2004. The Committee requested that the Commission submit its report no later than July 5, 2006. A copy of the request letter is included in app. A, and the Commission's notice of investigation, published in the Federal Register of August 8, 2005 (70 FR 45745), is in app. B.

[2] In its request letter, the Committee asked that the Commission's analysis focus on navel oranges and lemons produced for the fresh market to the extent possible, with information provided on broader segments as appropriate.

[3] Orange types and varieties that are not included in this report include hybrids (e.g., temples or tangelos), or the category of oranges that includes mandarin oranges (*Citrus reticulata Blanco*), satsumas (*Citrus unshiu Marcow*), clementines (*Citrus clementina Hort.ex Tan.*), and tangerines (*Citrus tangerina Hort.ex Tan.*).

for examination in this report are Argentina, Australia, Chile, China, Mexico, South Africa, and Spain which are the major competitors with the U.S. industry in either one or both fruits in their fresh state. Most of the data presented in this investigation cover 2000-2004, however historical and 2005 information are also included, as available.

In a qualitative discussion, the Commission identifies and considers a set of factors important to competition in the fresh market orange and lemon industries and analyzes each industry's performance with regard to those factors. The report also quantitatively assesses each country's reported production costs, average unit values of traded products, international market share, export orientation, and revealed comparative advantage. Based on these indicators, the report provides a relative assessments of the strengths and weaknesses of the conditions of competition affecting each country's fresh orange and lemon industry.

To gather information for this report, Commission staff conducted interviews with knowledgeable sources in the seven foreign countries as well as in the United States, and consulted a wide range of secondary sources for quantitative and qualitative information.[4] Commission staff also consulted academic, government, and industry publications and websites, and data sets available from international organizations such as the Food and Agriculture Organization (FAO) of the United Nations and the United States Department of Agriculture's (USDA) Foreign Agricultural Service (FAS). Data on U.S. and foreign production of oranges and lemons (volume, value, bearing acreage, yields, and domestic consumption) were available from USDA, foreign government sources, and the Departments of Agriculture of the states of Arizona, California, and Florida. Where possible, data for oranges are broken out by orange variety.

Trade data are presented from the Global Trade Atlas (supplemented by trade data from the United Nations) and, in most cases, data on trade in navel oranges are aggregated with that of other types of sweet oranges.[5] Most trade data for lemons and limes are aggregated, but are presented for lemons alone wherever possible.[6] Data on input production costs for oranges and lemons are obtained from a variety of sources, including industry trade associations, government sources, academia, and data compiled by Commission staff based on field interviews with growers and packers.

Organization

The report is divided into 11 chapters. Chapter 2 provides a global overview of production, trade, and consumption for all types of oranges and lemons. Chapter 3 provides the Commission's analysis of the strengths and weaknesses of the U.S. industry relative to its major foreign competitors and a comparison of each country's costs of production and prices. This chapter includes a qualitative analysis based on a set of competitive factors including production costs, and quantitative analysis using the symmetric revealed comparative advantage (SRCA) index. Chapter 3 also incorporates theoretical guidelines for undertaking international comparisons of costs of production for agriculture industries.

[4] The Commission's hearing for this investigation was scheduled for February 6, 2006, but was cancelled on January 25, 2006 after no requests to appear were received by the January 24, 2006 deadline. No written submissions were filed in connection to this investigation.

[5] Spain is the only country profiled that disaggregates navel oranges from other sweet oranges at the 8-digit level of the Harmonized Tariff Schedule. For purposes of this report, references to the EU include data for the EU-25 countries.

[6] Chile, the EU, and the United States disaggregate lemons and limes at the 8-digit level of the HTS.

Chapters 4 through 11 present country profiles of the United States and its major foreign competitors. The report is followed by several appendices. Appendix A reproduces the letter from the Committee on Ways and Means requesting this study, appendix B reproduces the Federal Register notice that announces institution of this investigation, and appendix C describes the theoretical underpinnings of the SRCA index presented in Chapter 3.

CHAPTER 2
Global Overview

Introduction

The international fresh orange and lemon producing sectors evolved substantially in recent years, driven by increased competition, and significant shifts in production, consumption, trade, and marketing. Over the last two decades, developing countries led growth in production and consumption, while output and consumption among traditional developed-country suppliers was stable or declined. Technological advancements in storage and shipping, and trade liberalization, resulted in expanded trade in the subject products. The rise in market power of global retailers also profoundly affected the sectors. Responding to shifting consumer preferences, retailers are requiring suppliers to meet quality and food safety standards at increasingly lower prices. This consumer-driven trend has significantly influenced global sourcing patterns and orchard management practices, and led to significant changes in the packing and processing sector.

This chapter provides an overview of the global markets for fresh oranges and lemons, including information on production, consumption, trade, pricing and marketing. Information is presented for the United States and selected producer countries, which are Argentina, Australia, Chile, China, Mexico, South Africa, and Spain.[1] A discussion of production and consumption of oranges destined for the fresh and processing markets is followed by information on trade in the fresh segment only. Long-term trends generally are discussed over the period 1985-2005. Certain global data for lemons are not available, as lemon and lime data are aggregated in most global production and trade databases.[2] Consequently, data for lemons/limes are generally presented, and lemon data are presented alone, where available.

The same industries that produce oranges and lemons typically also produce other citrus fruits. Citrus is cultivated in over 100 countries in the geographic region between 40 degrees North and 40 degrees South latitudes.[3] Production is relatively concentrated, with the top 10 producers accounting for more than two-thirds of global volumes. Global citrus production expanded steadily during the last two decades, reaching over 100 million metric tons (mt) in 2005. Oranges account for approximately two-thirds of citrus production, and fresh and processed oranges represent 60 percent of traded citrus products. Global citrus consumption has increased steadily over the last 20 years, reflecting consumer preferences towards healthier convenience foods in developed markets and income growth in developing markets. International trade in citrus products, the highest-value traded fruit products, increased substantially over the same period, aided by technological advancements in post-harvest treatment, storage, and shipping technology.

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[1] These countries are the United States' main competitors in fresh market production. The fresh production of these countries directly competes with U.S. production in the United States, as well as in key global markets.

[2] FAOSTAT aggegrates lemon and lime data. The harmonized tariff system code also aggregates lemons and limes under 0805.50. One of the few sources for disaggregated lemon data is USDA, FAS PSD data; however, this data set only covers selected lemon producing countries.

[3] UNCTAD, *Citrus Fruit*.

Citrus is produced in two main climate zones: tropical/semi-tropical and temperate Mediterranean. Growing conditions in these zones principally vary by rainfall amount and temperature. In tropical and semi-tropical climates, such as Florida, and parts of Argentina, Australia, and Brazil, orchards can be watered primarily by rainfall. In Mediterranean growing climates, such as California, and parts of Australia, Chile, South Africa, and Spain, orchards need to be irrigated. Climate is an important determinant of the citrus type produced and its end use. Most Florida oranges (mainly Valencia varieties) are processed into juice products. Likewise, in Argentina, a significant proportion of lemon output enters the processed market. In Mediterranean climates such as California, orange production (including navel and Valencia varieties) primarily supplies fresh markets. Climate is also the leading factor influencing the incidence of pests and diseases. Generally, tropical climates, which are more humid, have higher disease and pest profiles than drier temperate climates.

Production

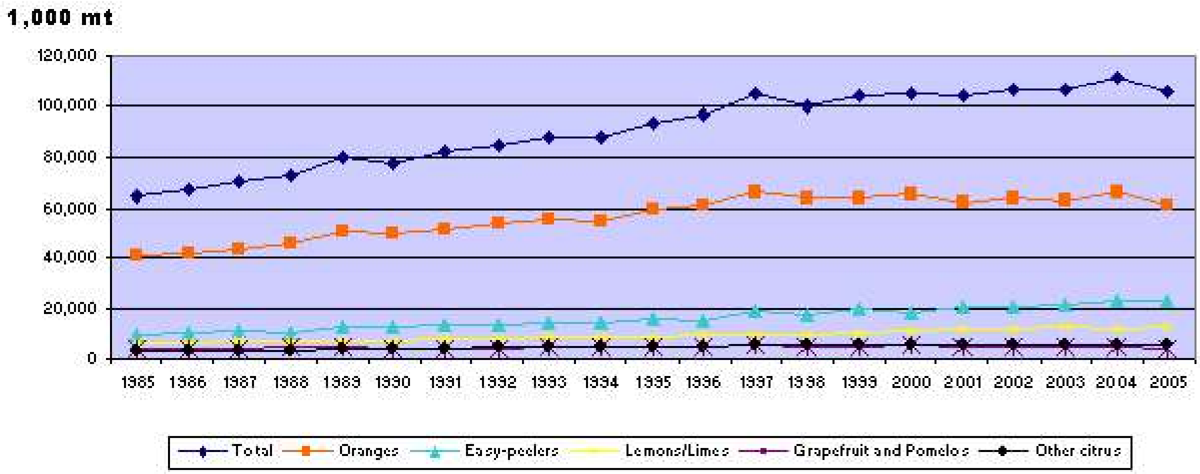
World production of citrus totaled 113 million mt in 2005, and has expanded steadily during the last two decades, at an average annual rate of 3 percent per year (figure 2-1). Output grew by about 80 percent during the period, while planted area expanded by over 50 percent, reaching 5 million hectares (ha) in 2005. Developing countries accounted for almost the entire growth in world citrus production during 1985-2005 as their output and planted area nearly doubled. In major developed countries such as the United States and Spain, total output of citrus was relatively unchanged during 1985-2005 with both increasing by less than 5 percent. Ranked by output, major competitor countries for all types of citrus are China (which produces mainly mandarins and oranges), Mexico (oranges and limes), Spain (oranges, clementines, and lemons), South Africa (oranges and lemons), Argentina (lemons and oranges), Australia (oranges and lemons), and Chile (oranges and lemons). These countries are also the major international competitors for fresh-market oranges and lemons.

Citrus products fall into 4 main commodities: oranges, easy-peelers (e.g., tangerines, clementines, and mandarins), lemons and limes, and grapefruits. Oranges account for the largest share of production (nearly 60 percent of total citrus) (figure 2-2). Easy peelers, the second-largest category by volume (21 percent of global citrus output), experienced the highest production growth rates, more than doubling to 23 million mt. Strong growth in easy peelers was fueled by income growth in developing country markets and consumer preferences for easy-peeling citrus products in developed country markets such as the United States. Lemons and limes are the third-leading category of citrus produced by volume, and the second-leading citrus commodity in terms of output growth, nearly doubling to about 13 million mt during 1985-2005.

Global orange production totaled about 60 million mt in 2005 and the global planted area was approximately 3.6 million ha (figure 2-3). During the last two decades, output of oranges expanded by one-half, while planted area grew by 20 percent, suggesting strong growth in global yields during the period. Expansion of yields was brought about by significant advancements in orchard management and post harvest treatment, including increased use of fertilizers and pesticides, more efficient irrigation and fertigation[4] systems, and a general trend towards greater orchard tree density.[5]

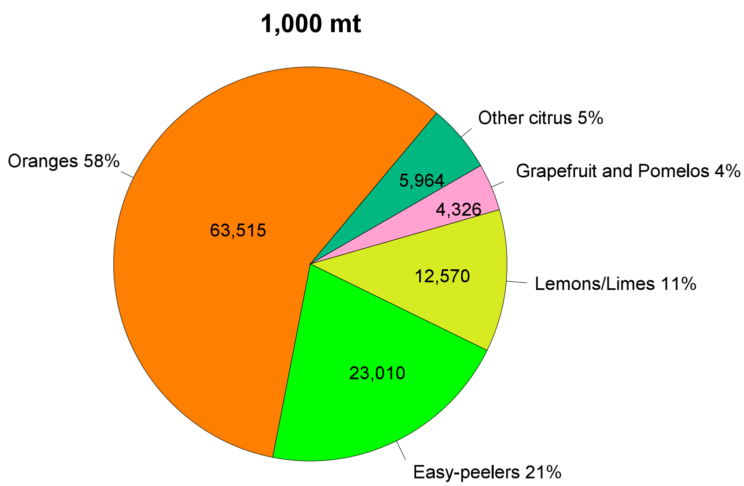
[4] Application of fertilizers through irrigation systems.
[5] UNCTAD, *Citrus Fruit*.

Figure 2-1 Citrus: Global production by type, 1985-2005



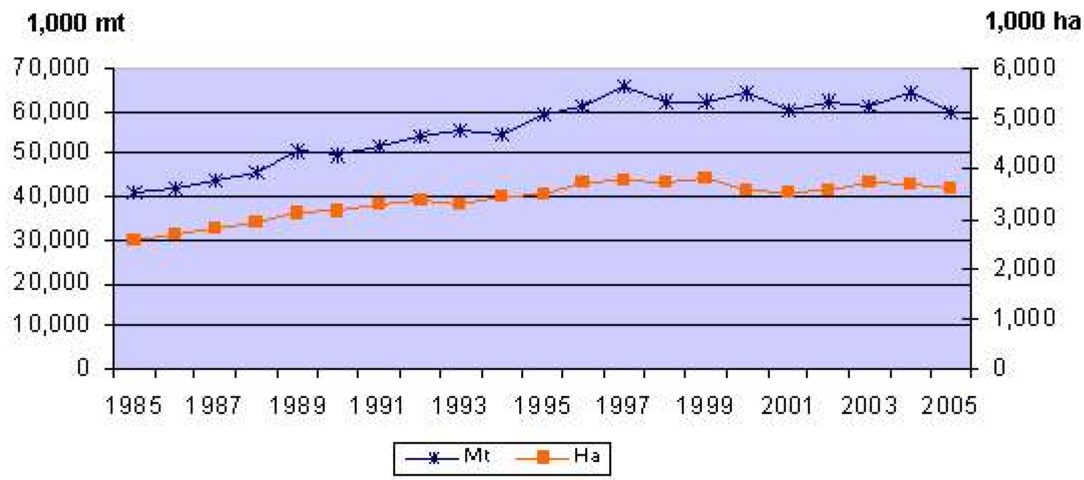
Source: FAOSTAT data 2005.

Figure 2-2 World citrus production: Shares by type average, 2003-2005



Source: FAOSTAT data 2005.

Figure 2-3 Oranges: Production and hectarage, 1985-2005

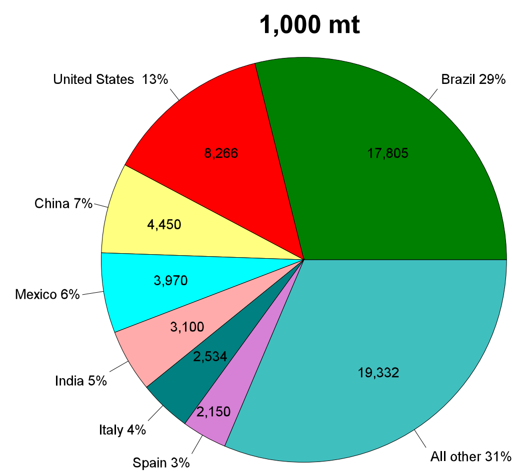


Source: FAOSTAT data 2005.

Brazil and the United States are the world's leading orange producers, and together accounted for over 40 percent of global output in 2005 (figure 2-4). Brazil is not considered a major competitor country for the purposes of this report because its fresh orange production mainly serves domestic consumption and does not compete with that of the United States in Brazil, in the United States or any other foreign market. Nor does Brazil have significant lemon production. Almost 70 percent of Brazil's total production is processed for export. Similarly, about 80 percent of total U.S. orange output is processed into juice, but mainly channeled to the domestic market. U.S. production of fresh market oranges is centered in California (2 million mt), which primarily produces navel varieties. Other leading world orange producers during 2005 included China (4.4 million mt), Mexico (4.0 million mt), and Spain (2.1 million mt). A substantial share (one-third of world production, or nearly 20 million mt of oranges), is produced in more than 50 other countries, and mostly supplies domestic fresh markets.

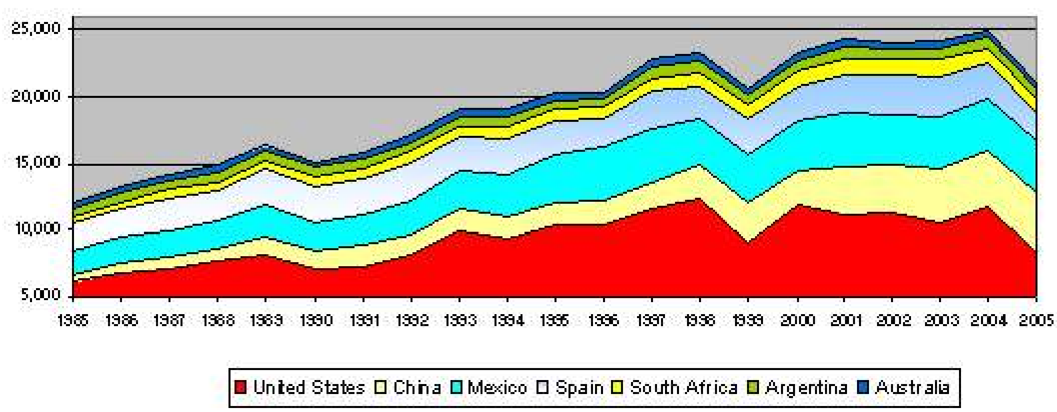
Figure 2-5 shows fresh orange production for the United States and other major competitor countries between 1985 and 2005. Of the group, developing country producers had the largest expansion in output during the period. China's orange production increased by over 600 percent during the period, led by strong domestic demand owing to income growth. In Mexico, where fresh oranges are mainly used for juicing in the home, output doubled during the period. South African production rose by 80 percent, fueled by strong growth in exports during the period. Output of oranges also expanded in developed major competitor countries, but at slower rates. Orange production in the United States grew by 36 percent (with a drop in 2005, attributable to poor weather conditions), in Australia by 12 percent, and in Spain by 8 percent.

Figure 2-4 Oranges: Share of world production, 2005



Source: FAOSTAT data 2005.

Figure 2-5 Oranges: Production by selected producers, 1985-2005

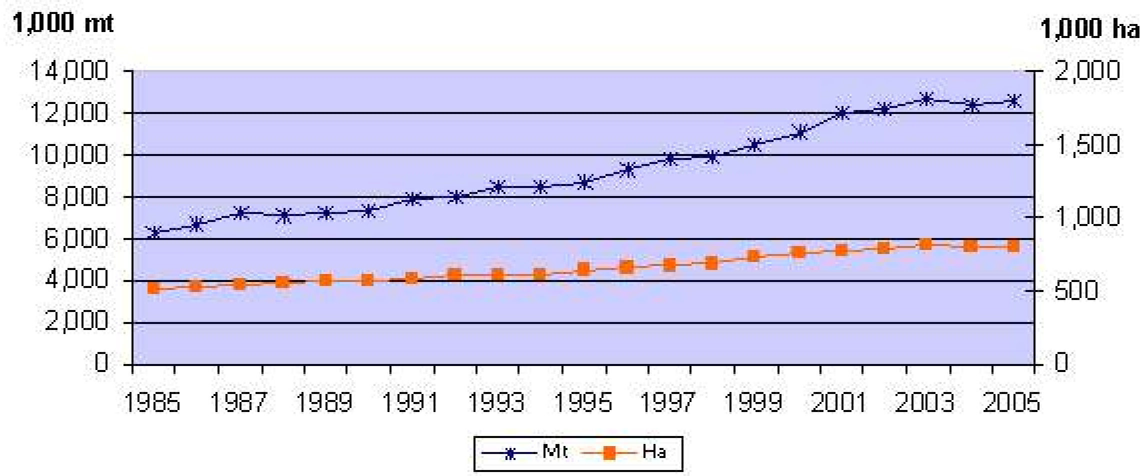


Source: FAOSTAT data 2005.

Global production of lemons and limes doubled reaching over 12 million mt in 2005, while planted area rose by about one-half during the period (figure 2-6). Leading world producers of lemons include Argentina, with average annual production of 1.3 million mt, the United States (786,000 mt), and Spain (734,000 mt) (figure 2-7). In 2005, approximately two-thirds of world lemon production was destined for the fresh market, and one-third for processing.[6] Global output of lemons has increased in recent years because of increased production in developing countries, particularly Argentina.[7]

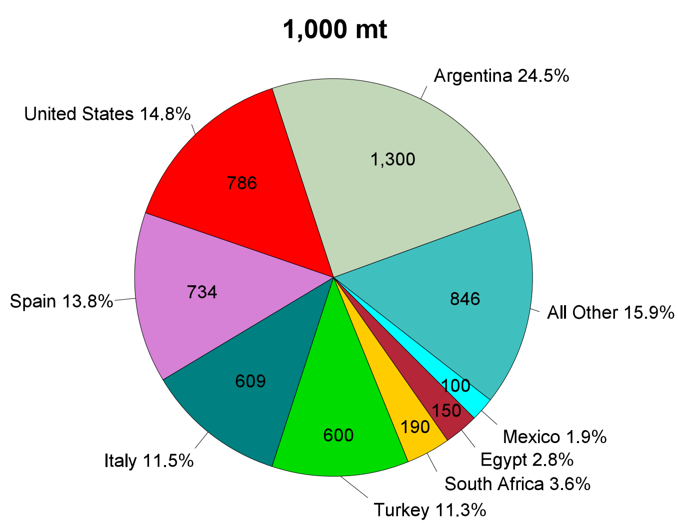
[6] Commission estimate based on USDA, FAS, PSD database.
[7] Interviews with U.S. industry representatives, September 26-27 2005, Yuma, Arizona.

Figure 2-6 Lemons/limes: World production and hectarage, 1985-2005



Source: FAOSTAT data 2005.

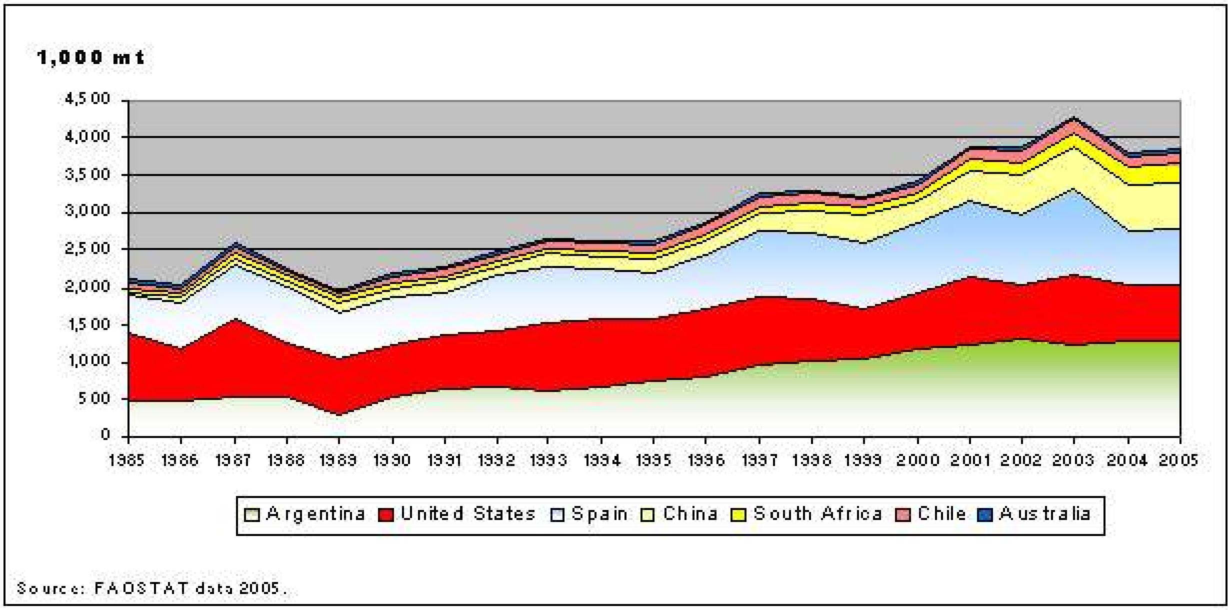
Figure 2-7 Lemons: World production, 2005



Source: Compiled by Commission staff.

With the exception of the United States and Australia, production growth of lemons and limes among major competitor countries between 1985 and 2005 was strong (figure 2-8). In Argentina, output rose by 180 percent, primarily as the result of investment by global soft drink manufacturers to produce processed lemon products. China's lemon/lime production saw the largest output gains, expanding 10-fold during the period owing to increased domestic demand resulting from income growth. South African production of lemons also more than doubled during the period due to strong export demand in the EU, Hong Kong, and Middle East markets.

Figure 2-8 Lemons: Production by selected producers, 1985-2005



Consumption[8]

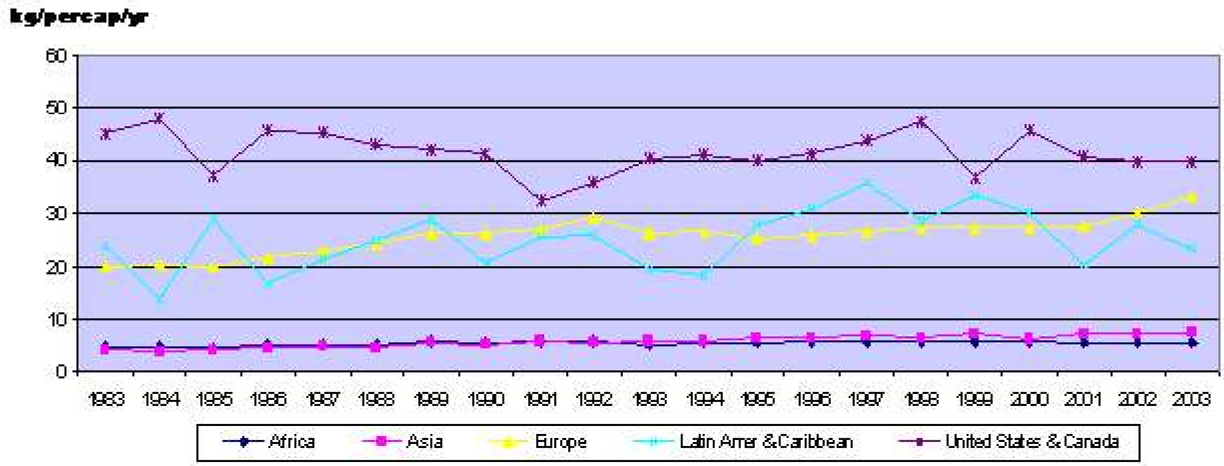
Global consumption of citrus is dominated by fresh and processed oranges (mainly juice). The highest levels of per capita consumption of oranges during 1983-2003 were in industrialized, high-income countries. However, the strongest growth in per capita consumption, especially since the mid-1990s, was in developing countries with growing income such as Brazil, China, and India. Growth in per capita consumption of fresh oranges in high-income countries and regions, such as the United States and the EU, has stagnated or declined in recent years because of shifts in consumer preferences, resulting in increased demand for convenience-packaged forms of orange juice and consumption of a wider variety of alternative fruits that are increasingly available year-round.

Global per capita consumption of oranges was over 11 kg in 2003, and increased by nearly 30 percent during 1983-2003.[9] Per capita consumption in developed countries was three times the level of per capita consumption in developing countries. However, the total growth in per capita consumption was much higher in developing countries (55 percent) compared to developed countries (17 percent). Figure 2-9 shows per capita consumption of oranges by region during 1983-2003. The highest consumption rates were in the United States, Canada, the EU, and Latin America. The lowest consumption rates by region were in Africa (mainly because of low incomes) and Asia. Among orange importing countries, per capita consumption declined in Japan, Russia, and the United States, while per capita consumption increased in Canada, the EU, and South Korea (figure 2-10).

[8] The latest data on global per capita consumption of oranges and lemons/limes is 2003, based on FAOSTAT data.

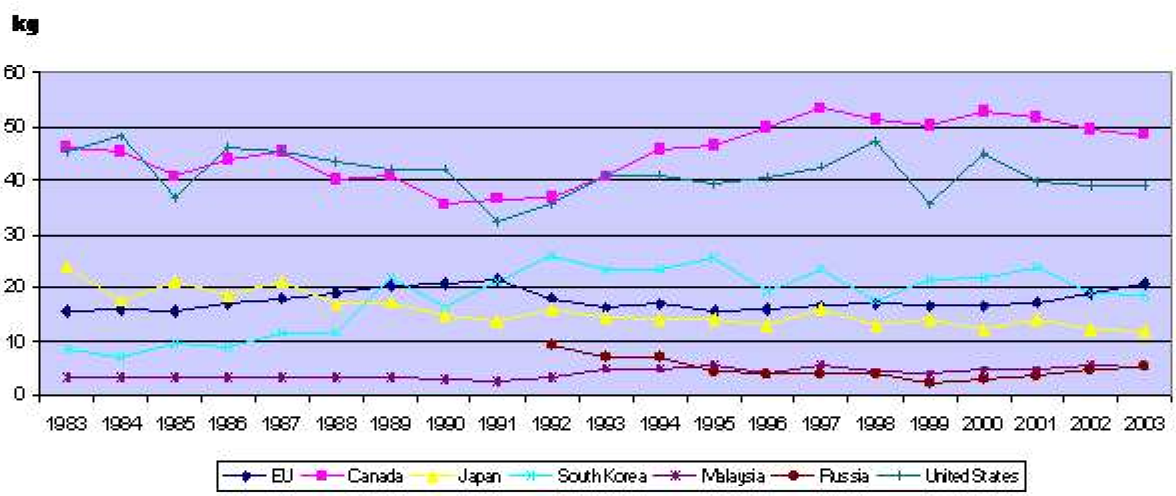
[9] FAOSTAT data includes consumption of mandarins and includes processed products, such as orange juice. All per capita consumption data discussed in this section is based on FAOSTAT data (2005).

Figure 2-9 Oranges and mandarins: Per capita consumption by selected regions, 1983-2003



Source: FAOSTAT data 2005.

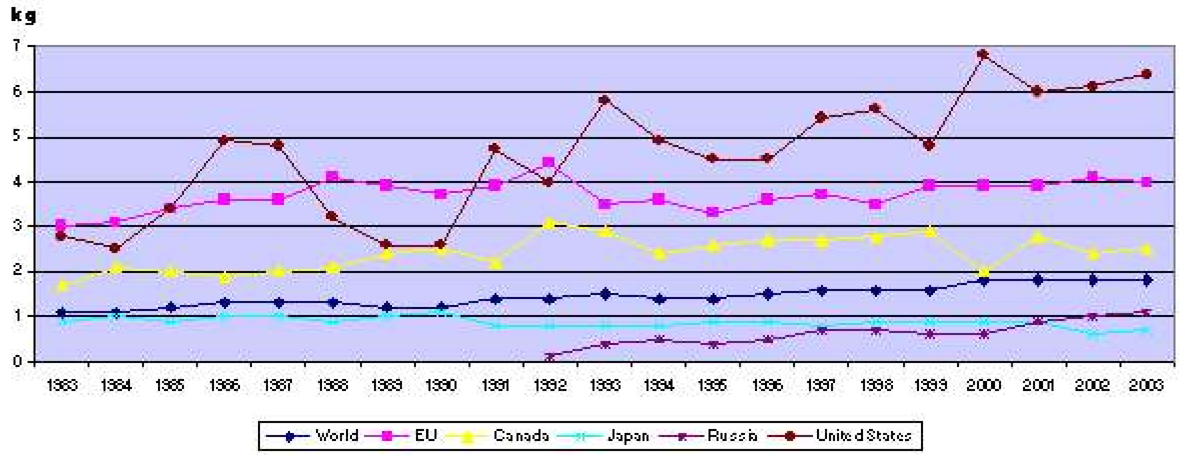
Figure 2-10 Oranges and mandarins: Per capita consumption by leading importers, 1983-2003



Source: FAOSTAT data 2005.

Global lemon/lime per capita consumption has been relatively stable over 1983-2003, and totaled about 2 kg per person in 2003. The highest rates of consumption among leading importers were in the United States, the EU, and Canada (figure 2-11). Per capita consumption in major competitor countries indicates relatively high levels of consumption relative to world consumption. The highest rates of consumption were in Spain (11.2 kg), Argentina (9.7 kg), and the United States (6.4 kg). Per capita lemon consumption in China is less than 1 kg per year, but is expanding. With the exception of Argentina and Australia, per capita consumption of lemons increased for most major competitors.

Figure 2-11 Lemons/limes: Per capita consumption by leading importers, 1983-2003



Source: FAOSTAT data 2005.

Trade[10]

Most of the world's citrus production, including oranges and lemons, is consumed domestically. However, international trade in citrus products (fresh and processed) expanded by 75 percent during the last two decades. In 2004, approximately 10 percent, nearly $3 billion, of global citrus production was exported, making citrus the world's top traded fruit.[11] Technical advancements in post-harvest treatment, shipping, and storage facilitated the expansion of trade to meet rising global demand. Moreover, phytosanitary agreements between exporting and importing countries also contributed to the increased world shipments of citrus products.

World Exports

World exports of fresh oranges totaled 5 million mt in 2004, while lemon/lime exports were more than 2 million mt (figure 2-12). Both commodities experienced strong export growth during 1985-2004, expanding by 30 percent and 90 percent, respectively. Total exports of fresh oranges from the United States and major competitor countries more than doubled during 1985-2004 (figure 2-13). South Africa and Australia had the largest percentage increases in exports because of counterseasonal trade, particularly to the United States and Europe. Among major competitor lemon producers, Argentina also experienced rapid export growth, primarily by supplying counterseason fresh lemons to Europe, one of the world's largest consuming regions.

[10] This section covers trade in fresh oranges and lemon/limes only.
[11] Global Trade Atlas. Including intra-EU trade.

Figure 2-12 Fresh oranges and lemons/limes: World exports, 1985-2004

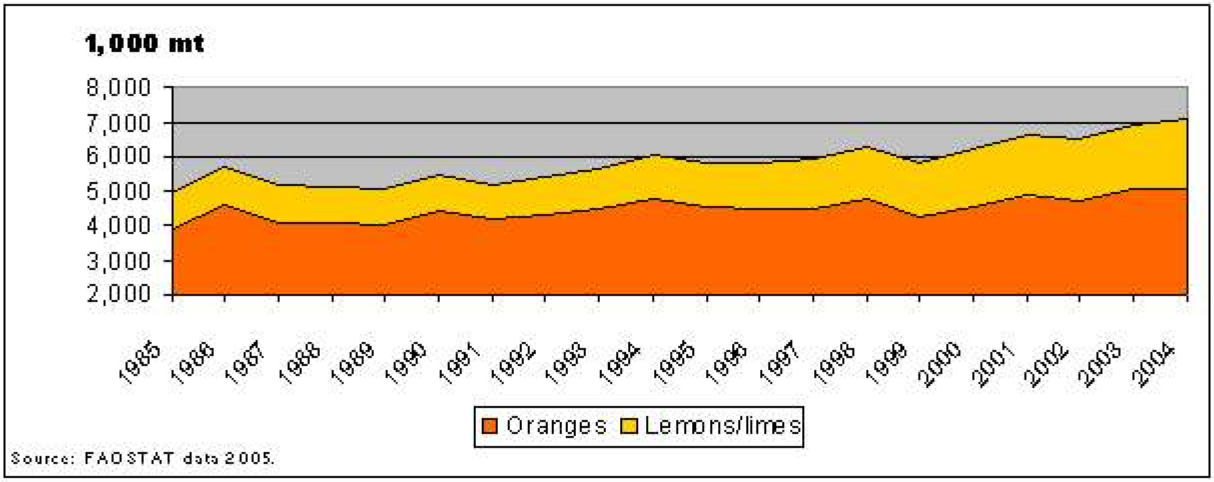
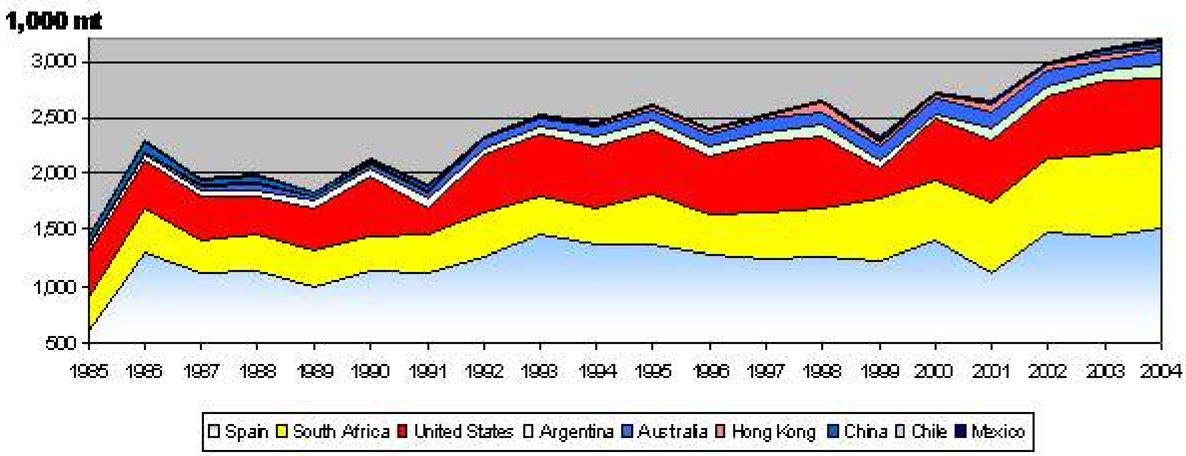


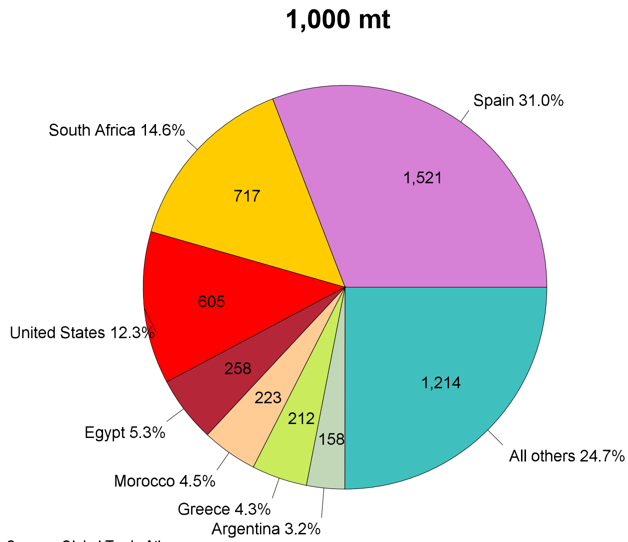
Figure 2-13 Fresh orange exports: Selected producers, 1985-2004



Source: Global Trade Atlas.

A small number of countries account for the bulk of exports of fresh oranges and lemons. In 2004, Spain ranked as the top global fresh orange supplier with exports valued at about $1 billion, or just under one-third (1.5 million mt) of the 5 million mt of total world exports (figure 2-14). Spain is the leading supplier to the EU, the world's leading fresh orange market, and benefits from proximity to, and trade preferences with, its EU partners. The United States was the second-leading exporter of oranges by value ($369 million) and the third-leading exporter by volume (605,000 mt) in 2004. Major U.S. markets in 2004 included Canada, Hong Kong, and Korea. South Africa ranked as the world's third-leading exporter of fresh oranges in 2004 by value, with exports valued at $273 million (717,000 mt). South Africa is the leading Southern Hemisphere supplier of fresh oranges and the leading counterseasonal supplier to the United States and Europe.

Figure 2-14 Fresh oranges: Share of world exports by major country, by volume, 2004



Source: Global Trade Atlas.

Spain also ranked as the top world supplier of fresh lemons in 2004, accounting for nearly one-fourth of global trade, with exports valued at $360 million (538,000 mt) (figure 2-15).[12] As with oranges, Spain is mainly a regional European supplier with nearly all exports destined for European markets. Argentina ranked as the second-leading world exporter of lemons in 2004 (by volume) with exports of 320,000 mt.[13] Argentina is the world's leading counterseasonal supplier of lemons, with over 80 percent of its exports destined for Europe and Russia. Among major trading countries, South Africa is the next leading counterseasonal lemon exporter by volume. Its leading markets are more widespread and include Asia, the EU, and the Middle East.

World Imports

The EU-25 (external trade) was the largest importer of fresh oranges by value ($475 million) and volume (774,000 mt) in 2004 (figure 2-16). Other leading importers of oranges included Russia ($155 million), South Korea ($137 million), Hong Kong ($130 million), and Canada ($127 million). The United States ($59 million) is a relatively small market for fresh orange imports, accounting for just over 2 percent of the total value of world imports in 2004.

Imports of lemons and limes are relatively concentrated, with the EU-25 (external trade) and the United States accounting for over one-half of the value and volume of global imports in 2004 (figure 2-17). Other leading importers by value in 2004 were Japan ($105 million) and Russia ($90 million).

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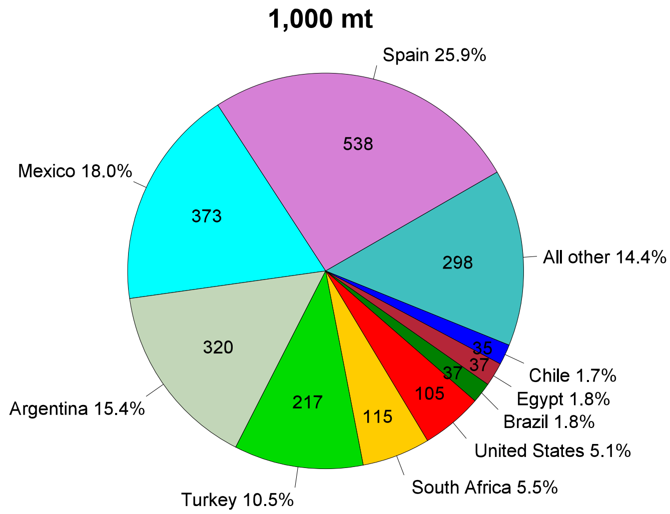
[12] Of the leading exporters of lemons/limes, only Mexico produces mostly limes. Less than 5 percent of Mexico's lemon/lime exports in 2005 is believed to be lemons.

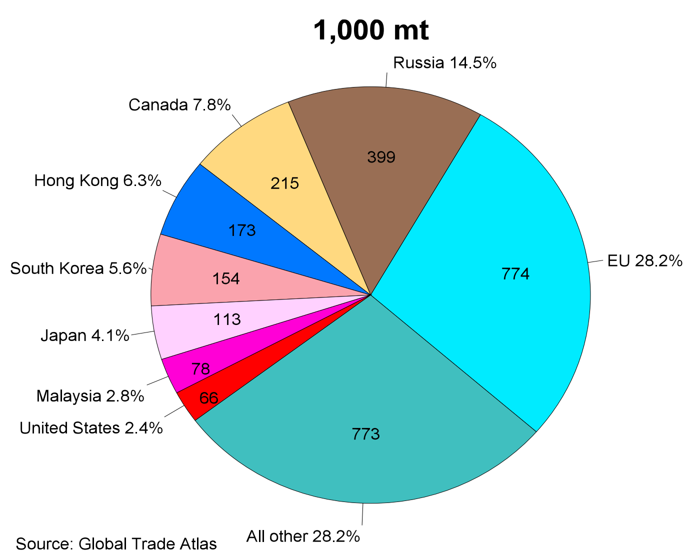
[13] Although Mexico is the second-leading exporter of lemons/limes, its exports are mostly limes.

Figure 2-15 Fresh lemon/limes: Share of world exports by major country, by volume, 2004



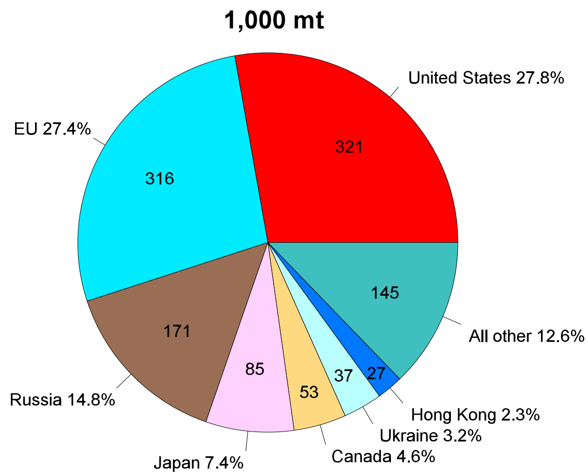
Source: Global Trade Atlas.

Figure 2-16 Fresh oranges: Share of world imports, by major country, by volume, 2004



Source: Global Trade Atlas

Figure 2-17 Fresh lemons/limes: Share of world imports by major country, by volume, 2004



Source: Global Trade Atlas.

Trade flows of fresh oranges and lemons for major competitor countries are provided in figures 2-18 and 2-19, respectively.[14] The figures indicate that the world market for fresh oranges and lemons is somewhat segmented, as competitor countries supply only certain markets at certain times based on geographic location, phytosanitary conditions, and other factors.

Trade and Competition in the U.S. and Global Markets

The U.S. share of world orange and lemon exports has declined since 2000 as increased citrus exports from competitors encroach on U.S. market shares. Canada, China, the EU, Japan, South Korea, and the United States are important markets for fresh orange and lemon exporters. U.S. exporters are increasingly focused on China, Japan, and Korea. Many of these citrus markets were traditionally closed to citrus trade until the late 1980s and early 1990s when the United States became the first country to sign bilateral market access agreements for citrus trade into important markets.

Japan

The United States became the sole fresh citrus supplier to Japan after the U.S.-Japan Beef-Citrus Agreement of 1989. Since then, however, other countries have also gained access, reducing U.S. orange and lemon market share, even while Japan increased its overall imports. Argentina, Chile, and South Africa continue to increase their market shares.[15]

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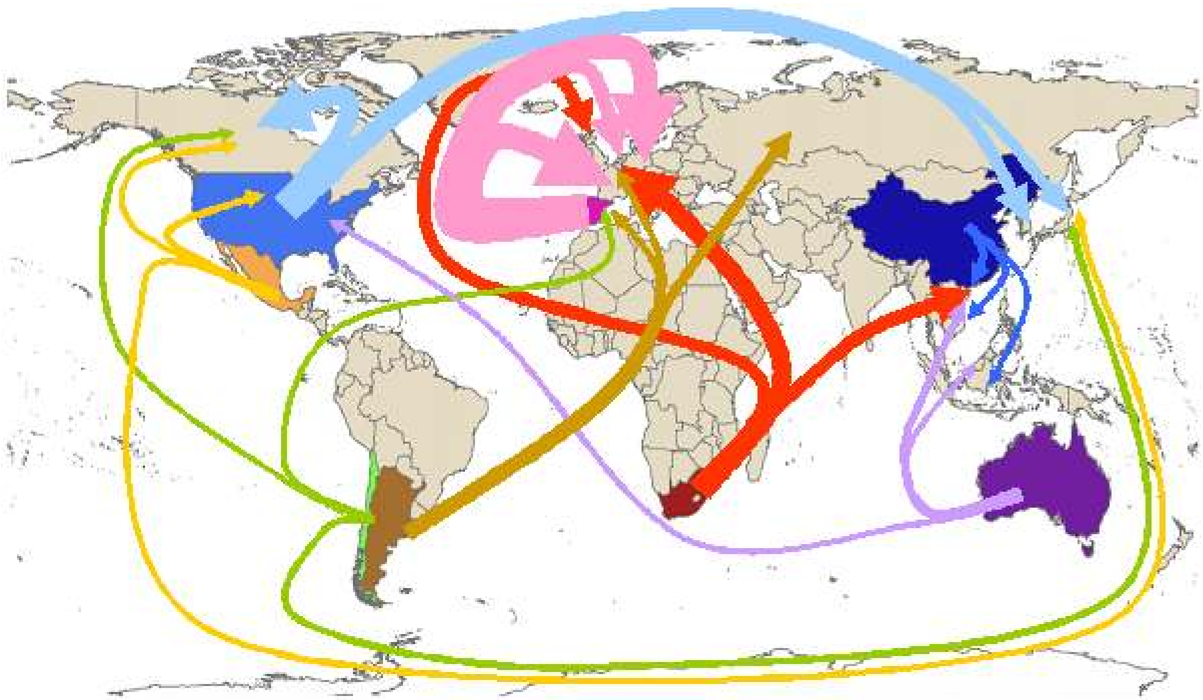
[14] The thickness of the arrows in figures 2-18 and 2-19 indicate the relative magnitude of export volumes. The leading three export markets for each country are shown.

[15] USDA, FAS, “The World Fresh Fruit Market, 5;” and FAOSTAT (2004).

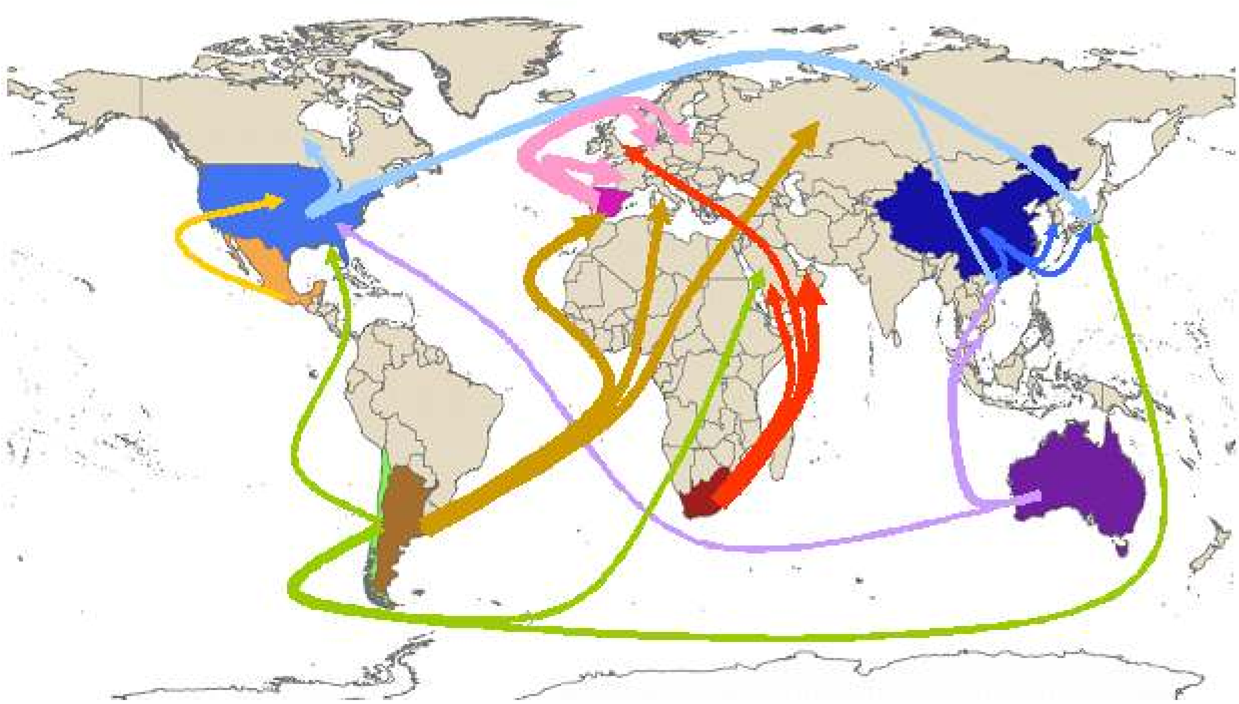
Figure 2-18 Fresh oranges: Trade flows for major competitor countries, 2005



Source: Global Trade Atlas, and DataWeb.

Note: The thickness of the arrows indicates the relative magnitude of export volumes.

Figure 2-19 Fresh lemons: Trade flows for major competitor countries, 2005



Source: Global Trade Atlas, and DataWeb.

Note: The thickness of the arrows indicates the relative magnitude of export volumes.

U.S. new crop navel oranges begin arriving in Japan in late November, and compete in the Japanese market with domestic unshu mikan tangerines, Australian Valencias, and Chilean navels until about December.[16] U.S. oranges tend to be priced substantially higher than domestic tangerines and are mainly purchased in December as holiday presents. The prime sales period for U.S. oranges is from February through May, when Japanese, Australian, and Chilean fruit is no longer available. The United States accounted for 75 percent of Japanese fresh orange imports in 2005. During the 2004-05 period, Chile (10 percent share), South Africa (9 percent), and Australia (7 percent) gained market share.[17] Although U.S. oranges are maintaining their share of the Japanese market during the U.S. season, Japan is importing more oranges from Southern Hemisphere suppliers in the U.S. off-season following market access agreements with those suppliers.[18]

Japan is also an important market for lemons. Although Japan produces some lemons, the quality is lower and prices are generally higher than those of imports, because of relatively high production costs. Japanese consumers are willing to pay progressively higher prices per kilogram for lemons commensurate with their size.[19] The United States (70 percent share in 2005), Chile (18 percent), and South Africa (9 percent) are Japan's main suppliers. Chile and South Africa supply lemons to Japan mainly during their summer seasons, while the United States supplies lemons year-round.

The EU

The EU is the world's largest importer of fresh citrus, but is a relatively minor market for U.S. fresh citrus exports. U.S. fresh orange and lemon exports to the EU have been trending downward since 1997. This is primarily the result of relatively high seasonal EU tariff rates.[20] Several EU members, including Spain, Italy, and Greece, are important citrus growers and receive intra-EU duty preference rates. Extra-EU suppliers of oranges and lemons, mainly in the Southern Hemisphere, supply fruit to the EU in the off-season. The main external-EU fresh orange suppliers in 2005 were South Africa (36 percent), Morocco (15 percent), Egypt (12 percent), Uruguay (7 percent), and Argentina (7 percent). In the case of fresh lemons, the principle external-EU fresh lemon suppliers were Argentina (61 percent), Turkey (22 percent), and South Africa (11 percent) in 2005. The United States accounted for less than 1 percent of EU fresh orange and lemon imports that year.[21]

South Korea

Since the Korean market opened to citrus imports in the late 1990s, the United States has been its principal supplier, and continues to dominate the Korean market for fresh oranges, mainly in navels. Although the United States competes with Australia, Chile, New Zealand, and South Africa in the Korean market, U.S. oranges are strong performers in the Korean

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[16] USDA, FAS, *GAIN Report* No. JA5057, 6.

[17] Ibid., 14. The time periods in this section correspond to marketing years.

[18] Global Trade Atlas. Includes EU External Trade.

[19] USDA, FAS, *GAIN Report* No. JA5057, 8.

[20] EU tariff rates on oranges are currently bound at 8 different seasonal rates which vary depending on time of year. The highest rate of 16 percent + 71 i /MT applies from December 1 - March 31, which corresponds to the height of the U.S. navel growing season. For April, the rate is 10.4 percent + 71 i /MT. For May 1 - May 15 the rate falls to 4.8 percent + 71 i /MT, and falls again between May 16 - May 31 to 3.2 percent + 71 i /MT. EU rates for fresh lemons are bound at 6.4 percent + 256 i /MT throughout the year.

[21] Global Trade Atlas. Includes EU External Trade.

market owing to consumer acceptance and competitive prices.[22] In the 2004-2005, the United States held a 94 percent market share, followed by South Africa (4 percent) and Australia (1 percent). Korea's stringent preclearance and import requirements for Spanish and South African oranges had inhibited imports from those countries until 2004, while oranges from Australia are more expensive relative to local fruit.[23] Other countries such as Argentina and Egypt are stymied by phytosanitary restrictions, although Korea has entered into discussions with these suppliers regarding protocols. As it increases exports to other Asian markets, China may eventually be able to compete against U.S. oranges in the Korean market.[24] China's citrus exports will likely benefit from its proximity to important Asian import markets and duty-free access to most markets under the recently enacted China-ASEAN free trade agreement.[25] Strong U.S. performance in the Korean orange market has also been attributed to protocol requirements that are less likely to damage fruit, such as fumigation and other treatments which are required of other suppliers and that can reduce the quality of the fruit.[26]

Korean orange imports during 2004-2005 were 124,000 mt and valued at $120 million.[27] Although Korean in-quota and out-of-quota tariff rates for oranges were equalized in 2004, tariff rates are high, e.g., 50 percent in 2006.[28] Compared to fresh oranges, the market for fresh lemons in Korea is much smaller, totaling 4,383 mt with a value of $4.8 million in 2004-2005. That year, the U.S. share of Korean fresh lemon imports was 88 percent, and the only other supplier, Chile, had a 12 percent share.[29]

Russia

Russia is an important and growing market for citrus. Currently, Russia imports about 16 percent of all world citrus imports by quantity and is the largest citrus importer among the developing transitioning countries.[30] In 2005, the major citrus suppliers to Russia were Turkey (24 percent), Morocco (21 percent), South Africa (16 percent), and Spain (9 percent). Russian standards for quality and phytosanitation are less stringent compared to other markets such as the EU.[31] This is an advantage for countries such as Turkey and Morocco, which have difficulty meeting high EU standards but can produce citrus at low unit prices. In 2004, Russia imported almost 400,000 mt of oranges and 170,000 mt of lemons and limes.[32] The United States is not an important supplier to Russia, preferring to compete on quality for premium prices, and because of a lack of awareness of U.S. citrus among Russian importers and retailers.[33]

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[22] USDA, FAS, *GAIN Report* No. KS6048, 1.
[23] Ibid., 4.
[24] USDA, FAS, *GAIN Report* No. CH5084, 15.
[25] Duty-free trade of fresh produce is effective January 1, 2006 under the agreement.
[26] USDA, FAS, *GAIN Report* No. KS5061, 4.
[27] USDA, FAS, *GAIN Report* No. KS6048, 4.
[28] USDA, FAS, *GAIN Report* No. KS5061, 5.
[29] USDA, FAS, *GAIN Report* No. KS6048, 15.
[30] USDA, FAS, *GAIN Report* No. RS5319, 1.
[31] USDA, FAS, *Situation and Outlook for Citrus*, 6; and Global Trade Atlas.
[32] Ibid.
[33] USDA, FAS, *GAIN Report* No. RS5319, 4.

China[34]

While Chinese fresh fruit consumption has been rising along with personal incomes, citrus consumption has not kept pace with deciduous fruits, which can be stored for longer periods of time. Most citrus consumed in China is produced locally and relatively little is exported. Citrus fruit quality in local markets tends to be low except in large cities where the highest quality domestic oranges are sold. The flavor and appearance of Chinese domestically-grown oranges have improved significantly in recent years, allowing them to compete directly with imports, which historically where priced much higher than locally-produced fruit. In the past couple of years, however, this price gap has narrowed significantly as domestically-grown citrus has improved. The increased quality of domestic oranges, together with the high price of imported oranges, subject to a 25-30 percent effective tariff rate,[35] have negatively affected imports. Imports are forecast to continue to decline to about 45,000 mt in 2005-2006 from 48,000 mt in 2004-2005. Currently, Chinese orange imports are equal to about 1 percent of domestic production. Lemon imports are negligible, amounting to 5,000 mt 2004-2005 with a value of about $5 million.

The United States is the principal foreign supplier of oranges to the Chinese market with a 55 percent import market share, followed by New Zealand (22 percent), and South Africa (22 percent). As with Japan and Korea, the United States owes its high market share to early market access agreements with China. However, the U.S. and Chinese seasons overlap, so Southern Hemisphere suppliers are stronger performers in the U.S. off-season. Since Chinese domestic production is limited to October through February, only imported oranges are available in the off-season and these are mainly supplied by New Zealand and South Africa. China recently approved new orange import protocols for oranges from Australia and, in November 2005, China signed an import agreement for Spanish citrus.

Canada

Canada accounts for about 8 percent of world citrus imports and is the largest foreign market for U.S. fresh oranges.[36] In 2005, Canada imported 225,000 mt of oranges, with a value of $142 million. The main suppliers were the United States (68 percent share), South Africa (22 percent), Australia (3 percent), Chile (2 percent), and Argentina (2 percent).[37] The Southern Hemisphere suppliers ship to Canada in the U.S. off-season.

In 2005, Canada imported 41,000 mt of lemons with a value of $28 million from the United States (79 percent share of Canadian imports) and Argentina (18 percent).[38] Canada is the second-largest export destination for U.S. lemons after Japan, and accounts for over 20 percent of U.S. exports. Under the North American Free Trade Agreement (NAFTA), Canada eliminated its 20 percent duty rate on U.S. fresh lemons.[39] U.S. strength in the Canadian market can be attributed to geographic proximity, high quality of U.S. lemons, zero duties, and few phytosanitary restrictions.

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[34] Information for this section is primarily from USDA, FAS, *GAIN Report* No. CH5084, various pages.
[35] This includes the tariff plus the value-added tax (VAT).
[36] AGMRC, *Commodity Profile: Citrus*, 5.
[37] Global Trade Atlas.
[38] Ibid.
[39] AGMRC, *Commodity Profile: Lemons*, 5.

United States

The United States imports relatively small quantities of oranges and lemons in comparison to its production and exports, and most imports offset lower U.S. supplies during the U.S. off-season of late summer and fall. In the 2005-2006 marketing year, the United States is expected to import 65,000 mt of fresh oranges and 35,000 mt of fresh lemons; this represents only about 4 percent of domestic consumption for oranges and 7 percent for lemons.[40] During the past five years, imports have not gained market share in the U.S. market, although 10 years ago the import share was only 1.5 percent for oranges and 3 percent for lemons.[41]

Australia and South Africa are the largest sources of U.S. fresh orange imports, with 40- and 41-percent import shares respectively in 2005.[42] While Australian imports have grown modestly since 2000, South African imports have roughly tripled their share of the U.S. import market for fresh oranges since 2000. Their increased market share is attributable to their higher quality and rising U.S. demand for high quality and competitive prices, during the U.S. off-season.[43]

Chile and Mexico are the largest sources of U.S. lemon imports, accounting for 58 percent and 36 percent, respectively, of U.S. imports in 2005. Chile has doubled its import market share in the past four years, largely because of phytosanitary restrictions against Argentine lemons, which entered the U.S. market for the first time in 2001 but have been prohibited since. Mexico's share of U.S. imports has grown considerably (from a very small base), mainly because of the release of some lemons from dedicated supply contracts for lemon oil.[44] Spain's share of U.S. lemon imports dropped from 61 percent in 2002 to less than 3 percent in 2005, as U.S. importers shifted to Chilean and Mexican supplies.[45] The decline in Spain's market share during that period can also be attributed to a fall in Spanish production due to drought as well as EU enlargement, which opened more intra-EU markets for Spanish lemons.[46]

Global Pricing and Marketing

Prices for fresh oranges and lemons are determined primarily by market supply and demand factors. Generally, prices for fresh citrus are inversely correlated to seasonal production. Peak prices occur during the off-season when products are relatively scarce, and lower prices are associated with the high season when fruit is abundant. Short-term factors affecting supply include weather conditions and pests and disease prevalence; longer term supply conditions include amount of planted area and crop yields.[47] Factors affecting demand include consumer preferences, income levels, and accessibility and prices of other fresh fruits.[48] Fresh fruit prices are also highly dependent on quality, as the market is

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[40] USDA, FAS, *Fresh Lemons: Production, Supply and Distribution in Selected Countries,* 5.
[41] Ibid., 4.
[42] Global Trade Atlas.
[43] Ibid.
[44] Interview with U.S. and Mexican grower/packer/shippers, September 26-27, 2005, Yuma, AZ and December 7, 2005, Ciudad Victoria, Tamaulipas.
[45] Global Trade Atlas.
[46] USDA, FAS, *Situation and Outlook for Citrus,* 3.
[47] UNCTAD, *Citrus Fruit.*
[48] Ibid.

increasingly being driven by consumer preferences towards health and food safety. For many leading world suppliers, the highest quality fruit is exported and generally commands the highest market prices. However, world prices for fresh citrus have trended downwards during the last two decades owing to increased world production.[49]

Growers sell their fruit through three main marketing arrangements: the spot market, where harvested fruit is sold for cash at delivery; consignment, where fruit is handled by an agent who markets the fruit and pays the grower a percentage of the sale price; and direct contracting, where growers supply fruit according to specified standards often at a negotiated price. Direct contracting has been driven by the highly consolidated retail sector, which requires large quantities of quality fruit at low prices.

Retail sector consolidation is the most important recent trend affecting the fresh citrus industry. In most major markets, including the EU and the United States, and increasingly in Latin America and Asia, the retail sector is consolidating into a small number of very large supermarket chains that have significant market power.[50] These large retailers, responding to consumer preferences, are exerting increasing control over orchard management, packing house practices, and prices.[51]

Supply Chain

Commercial production of fresh oranges and lemons, including packing and marketing, is characterized by a supply chain network that is becoming increasingly sophisticated and specialized in service activities. Figure 2-20 illustrates the fresh fruit industry supply chain. Depending on the scale of operation and market outlet for the fruit, various segments of the supply chain may be combined. For example, small-scale growers may pack and market their own fruit. Value-added operations occur along all stages of the supply chain, including services such as packing, transportation, and cold storage.

Throughout the world, citrus industries display varying degrees of concentration. Orange and lemon growing sectors are characterized by a large numbers of small to medium-sized growers. Among the leading producing and exporting countries, Spain, the United States, South Africa, and Australia, the average farm size is under 40 hectares. Although individual growers may have relatively small operations, in certain supplying countries there is collaboration among growers to counter the increasing market power of the retail sector.[52] Large farmer cooperatives are prevalent in the United States and Spain, while in other producing countries such as Australia, Chile, and South Africa, groups of farmers may market their produce under a pooled system or may jointly own downstream facilities outside the cooperative structure, such as packing operations.

The global trend in citrus packing is consolidation to spread the fixed costs of capital investment and to supply the required volumes. Packing, particularly among internationally competitive suppliers, is increasingly being supplied by smaller numbers of larger-scale,

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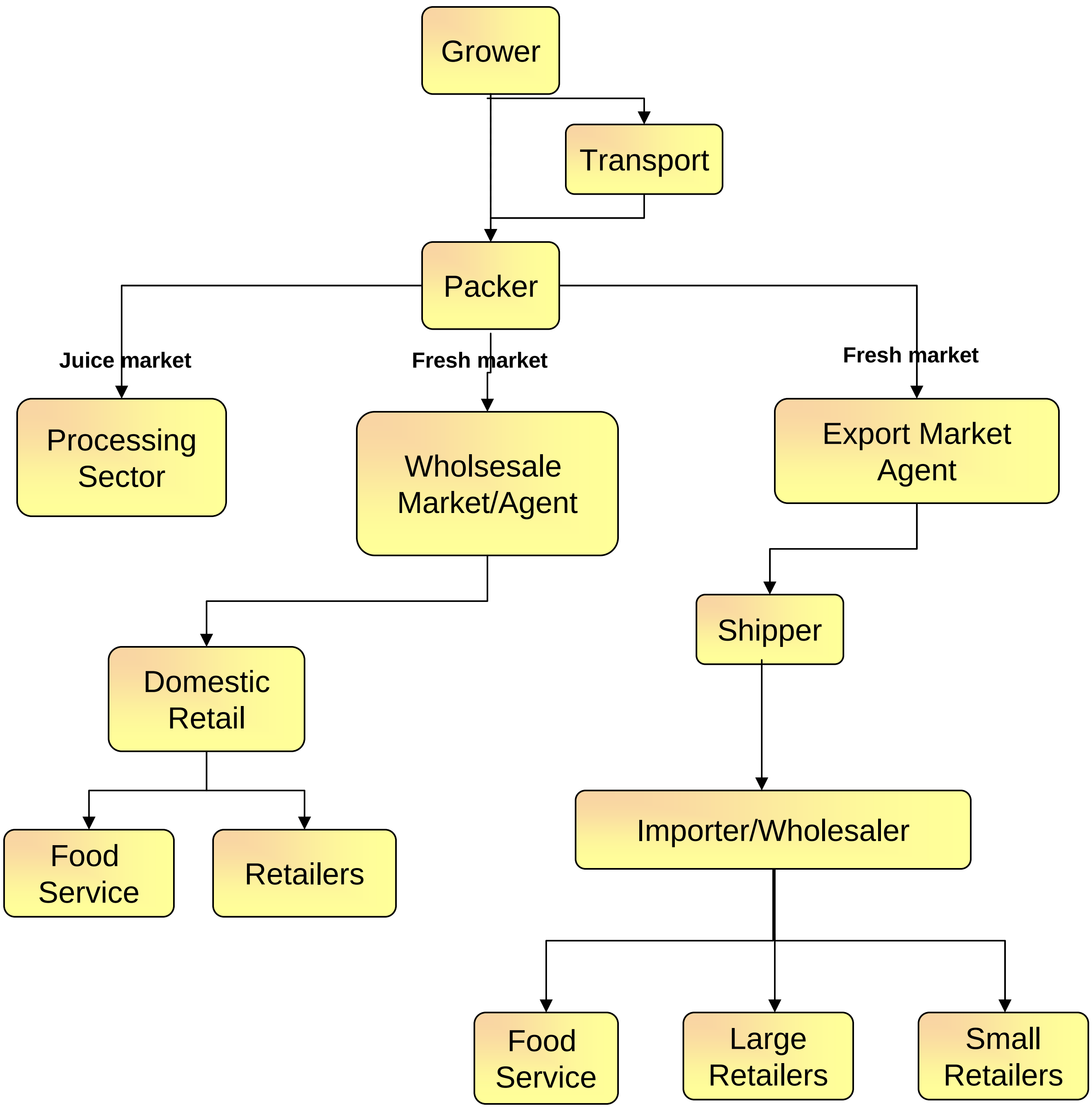
[49] Ibid.

[50] Ibid.

[51] An example is the *Euro-Retailer Produce Working Group for Good Agricultural Practices* (EurepGAP), established by leading European retailers in 1999. The Eurepgap certification program sets standards on quality, food safety, and traceability that cover most aspects of the production chain. See Eurepgap. *Control Point and Compliance Criteria*.

[52] UNCTAD, *Citrus Fruit*.

Figure 2-20 Fresh orange and lemon industry supply chain



capital-intensive, highly-automated facilities. This phenomenon has been driven by the highly consolidated retail sector, which requires large quantities of quality fruit at low prices. In order to meet these market requirements, packers must use labor-saving technology, including sophisticated and expensive washing, sorting, and packing equipment, and barcode tracking technology to ensure traceability.

CHAPTER 3
Competitive Conditions in Fresh Market Orange and Lemon Production

Introduction

The competitive environment in the global market for fresh oranges and lemons has changed significantly in recent years. A variety of factors has contributed to an increasingly competitive situation faced by the U.S. industry with respect to other major foreign competitors. Demand for fresh oranges and lemons in developed markets has leveled off and shifted toward processed products, while consumption in developing markets is increasing as incomes rise. New country suppliers have entered key global markets, including the United States, and have been increasing their market shares, particularly in counterseasonal markets. Many of the new market entrants are low-cost producers of high-quality oranges and lemons that compete directly with traditional suppliers by exploiting niche seasonal windows.

This chapter compares the strengths, weaknesses, and key statistics of the U.S. fresh market orange and lemon industries with its major foreign competitors. A comparison of the U.S. and foreign industries by country, showing key industry statistics, is presented below. Next, a comparison of factors affecting U.S. and major competitor industries, including a summary table and discussion, is presented. A detailed analysis of countries' production costs is then provided, followed by a presentation of countries' average unit values of orange and lemon exports. Finally, a measure of countries' comparative advantage and price competitiveness for each fruit is presented.

Industry Comparison

Factors such as total production volume, area, and yields can be used as a starting point to consider an industry's strengths and weaknesses. Table 3-1 compares key statistics, such as production, area, and yields, of fresh market orange and lemon industries in the United States and its major competitor countries (Argentina, Australia, Chile, China, Mexico, South Africa, and Spain).

For fresh oranges, China, Mexico, and the United States were by far the largest fresh orange producers during the period 2002-2004, in terms of volume. South Africa and Spain exported more than one-half of their total orange production during the period 2002-2004, while Australia and the United States exported approximately one-third and one-quarter, respectively. China and Mexico exported less than one percent each of their production, and served their domestic markets almost exclusively. Argentina and Australia exported similar volumes of oranges, but Argentine exports account for only about one-sixth of its production. The highest harvested yields during 2002-2004 correspond to export-oriented

Table 3-1 Oranges and lemons: Industry comparison, selected countries, average annual 2002-04

Product	Factor	U.S.[a]	Argentina	Australia[b]	Chile	China	Mexico	South Africa	Spain
Oranges	Total hectarage (1,000 ha)	[c]336	61	[d]24	8	453	348	36	141
	Production volume (1,000 mt)	10,139 (total) 2,043 (fresh)	740	498	120	3,962	3,950	1,176	2,902
	Production volume (1,000 mt) Navels	1,275	37	243	90	[e]2,200	17	445	1,780
	Harvested yield[f] (mt/ha)	33	13	22	16	9	9	44	23
	Exports (1,000 mt)	538	107	113	11	21	13	753	1,538
	Export-to-production ratio (%)	26	14	24	9	0.5	([g])	[h]76	52
	Imports (1,000 mt)	60	([i])	10	([i])	52	28	7	140
	Import-to-consumption ratio (%)	4	([g])	8	([g])	1	1	3	9
Lemons	Total hectarage (1,000 ha)	27	45	1	7	[e]9	2	5	46
	Production volume (1,000 mt)	798	1,190	32	150	[e]100	12	185	951
	Harvested yield[f] (mt/ha)	33	27	32	22	[e]9	7	69	21
	Exports (1,000 mt)	100	308	3	30	([i])	5	97	539
	Export-to-production ratio (%)	14	27	8	20	([g])	42	[h]61	55
	Imports (1,000 mt)	34	([i])	3	([i])	5	1	([i])	47
	Import-to-consumption ratio (%)	5	([g])	8	([g])	5	25	([g])	10

Source: Compiled by Commission staff.

[a]Except where indicated, U.S. data are for oranges grown for the fresh market.
[b]Data for Australian lemons includes both lemons and limes.
[c]Data represents total orange hectarage, including oranges grown for the fresh and processing markets.
[d]Data is for bearing hectarage only.
[e]Chinese navel and lemon volume and lemon area and yield are 2005 estimates.
[f]Harvested yields are calculated as total volume of production per bearing hectarage.
[g]Less than 0.5 percent.
[h]Ratio calculated from volume of fresh production only.
[i]Less than 500 mt.

countries, such as South Africa and the United States. Relatively low yields for China and Mexico reflect low technology production practices and a focus on the domestic market.[1] Argentina and Chile also have relatively low yields for oranges and low export orientation.[2]

[1] For additional detail, see chapters 8 (China) and 9 (Mexico).
[2] For additional detail, see chapters 5 (Argentina) and 7 (Chile).

For lemons, Argentina and Spain were the largest producers followed closely by the United States. South Africa and Spain exported more than one-half of their production. Chile exported one-fifth, while 14 percent of U.S. production was exported. Australia and China had insignificant involvement in global lemon markets during the period. High yields are generally associated with high export orientation, which is the case for South Africa, Argentina, and Spain. However, the United States and Australia also have high harvested yields but low export orientation.

Factors Affecting Performance of Fresh Market Orange and Lemon Industries[3]

A number of factors interact to determine the performance of fresh orange and lemon industries. Some are ultimately beyond the producers' control, such as natural endowments of climate, weather, and soil types, but may be managed by producers more or less effectively and at varying cost. Others are determined by government policies, such as environmental regulations and trade policy. Still others can depend on the ability of individual or groups of producers to boost yields and product quality by adjusting cultural (orchard) practices or production scales, and by controlling costs. An industry can be competitive domestically relative to imported product, yet not meet international standards or phytosanitary requirements in global markets and therefore rank low in export competitiveness.

The Commission examined the following factors to evaluate the strengths and weaknesses of the fresh market orange and lemon industries in the United States and its major competitor countries.

- Natural resource endowments
- Other producer resources: technology, capital, land, labor
- Scale of production
- Productivity/yields
- Seasonality
- Business climate and investment
- Government support and exchange rates
- Regulations: environmental, labor, sanitary and phytosanitary, food safety
- Market standards
- Production costs

An assessment of competitiveness for any industry is complex. Favorable conditions for any one factor or group of factors do not always result in higher relative performance or lower associated costs. The following section provides an assessment of each industry's performance using the aforementioned key factors based on an examination of numerous data sources, interviews, and fieldwork. Assessments made in this section regarding conditions of the U.S. and foreign industries are based on information cited in the country profile chapters that follow (chapters 4-11). Table 3-2 provides a summary of the Commission's assessment regarding these factors.

[3] Country-specific information in this section is drawn from the country profiles in chapters 4 through 11.

Table 3-2 Fresh orange and lemon industries: Comparison of competitive factors for U.S. and major competitor countries

	Product	Argentina	Australia	Chile	China	Mexico	South Africa	Spain	United States
Natural endowments	Oranges	XXX	XX	XXX	XXX	XXX	XXX	XX	XXX
	Lemons	XXX	XX	XXX	XX	XX	XXX	XX	XXX
Insect/disease conditions	Oranges	XX	XXX	XX	XX	XX	XXX	XX	XX
	Lemons	XXX	XX	XXX	XX	XXX	XXX	XXX	XX
Technology	Oranges	XXX	XXX	XXX	X	X	XXX	XX	XXX
	Lemons	XXX	XXX	XXX	X	XX	XXX	XX	XXX
Access to capital	Oranges	XXX	XXX	XXX	X	X	XXX	XXX	XXX
	Lemons	XXX	XXX	XXX	X	X	XXX	XXX	XXX
Land cost and availability	Oranges	XXX	XX	XXX	XX	XX	XX	X	X
	Lemons	XXX	XX	XXX	XX	XX	XX	X	X
Labor cost and availability	Oranges	XXX	X	XXX	XXX	XXX	XX	X	X
	Lemons	XXX	X	XXX	XXX	XXX	XX	X	X
Scale of production	Oranges	XXX	XXX	XXX	X	X	XXX	XX	XXX
	Lemons	XXX	XXX	XXX	X	XX	XXX	XX	XXX
Yields	Oranges	X	XXX	X	X	X	XXX	XXX	XXX
	Lemons	XXX	XXX	XXX	X	XX	XXX	XXX	XXX
Seasonality	Oranges	XXX	XXX	XXX	X	X	XXX	XX	XX
	Lemons	XXX	XXX	XXX	X	X	XXX	XX	XX
Business climate and investment	Oranges	XX	XXX	XX	X	XX	XX	XXX	XXX
	Lemons	XX	XXX	XX	X	XX	XX	XXX	XXX
Govt support	Oranges	XX	XX	XX	X	X	X	XXX	XX
	Lemons	XX	XX	XX	X	X	X	XXX	XX
Exchange rates	Oranges	X	XXX	X	XX	XX	X	XX	XX
	Lemons	X	XXX	X	XX	XX	X	XX	XX
Regulatory burden	Oranges	XX	X	XX	XXX	XX	XX	X	X
	Lemons	XX	X	XX	XXX	XX	XX	X	X
Market standards burden	Oranges	X	X	X	XXX	XXX	X	X	X
	Lemons	X	X	X	XXX	XXX	X	X	X
Production costs	Oranges	XXX	XX	X	XX	XXX	XX	XX	X
	Lemons	XXX	XX	X	NA	XXX	NA	X	XX

Source: Compiled by Commission staff.

Note: XXX denotes most favorable, XX favorable, X least favorable.

Natural Resource Endowments

Natural endowments, including the availability of water, soil quality, climatic conditions/patterns, and the presence of harmful insects and diseases, affect the intensity with which producers must manage their groves. Practices with respect to irrigation, fertilization, pest control measures, frost protection, and wind breaks translate into added costs that many growers deem necessary to remain competitive.

All major citrus producing countries generally have climatic conditions favorable to orange and/or lemon production, and most industries generally perform “best practices” management of orchards. Best practices at the grower level include optimal uses of irrigation, fertilizers, pesticides, tree densities, disease resistant root stocks, and hand pruning for high quality and yields. Most production in Australia, South Africa, Spain, and the United States is managed in this way. Export-oriented segments of the industries in Argentina, Chile, China, and Mexico may also be characterized as best practices management, while significant portions of production geared toward domestic markets may practice lower cost, less intense management. While some negative natural conditions can be overcome through good management, others, such as lack of water, are more problematic. Spain's periodic and severe droughts and Australia's water scarcity are weaknesses for their industries.

However, less intense management does not always result in lower quality production. For example, in certain regions of China and Mexico, high quality fruit is produced under low intensity orchard management due to optimal natural endowments of climate, precipitation, and soils. These producers, however, may not perform as well in export markets, since post-harvest handling of production is equally important in maintaining fruit quality to market.

Additionally, the presence of certain pests and diseases not only has the potential to reduce the marketable crop in a given year, but can lead to import bans in foreign markets and, over time, reduce productive bearing area in growing regions. Pests and diseases can be managed by individual producers with the use of chemicals or natural predators, but often industry-wide efforts are necessary. In such cases, industry and/or government organization is key to successful efforts.

Although bilateral agreements can be effective in maintaining trade flows of citrus, special handling and treatments can increase shipping times and add to costs. Fumigation can damage the fruit rind, significantly reducing shelf-life. Government inspections are costly to packers, in some cases adding up to 50 percent to the packing cost. Phytosantary concerns with respect to fruit fly infestations severely restrict Mexican exports to its main export partner, the United States. Argentine lemons and Chilean oranges are currently prohibited entry to the United States.[4]

Other Producer Resources

Technology

As noted, the level of technology used by a producer influences fruit quality and production efficiency. Technology refers to machinery and equipment as well as advanced plant research and development of plants. Overall, mechanization used throughout the production process, including in the orchard and for harvest, packing, and shipment, can reduce other costs such as labor. Modern, efficient packing operations and distribution networks, with cold storage, fumigation chambers, timing efficiencies, and plant research and development are typical of production in Argentina, Australia, Chile, South Africa, Spain, and the United States, although less so for oranges in China and Mexico.

In South Africa, computerized and wireless technologies are used for sorting by export market, to ensure traceability, and to monitor product location and temperature. In Australia,

[4] The U.S.-Chile Free Trade Agreement established a Committee on Sanitary and Phytosanitary Matters to enhance implementation of the agreement. A U.S. orange protocol for Chilean oranges is currently at the pest risk assessment stage and is expected to be completed within the next 2 years.

where limited water resources and high salinity are major concerns for the industry, producers utilize the latest irrigation technology. Argentina and Chile's export-oriented industries also employ the latest technology, including virus-free rootstock, pest and disease control measures, high-speed sorting and packing, cold-chain maintenance, and traceability.

In China, although farm-level production is characterized by limited use of machinery and equipment, producers are generally knowledgeable with respect to seedling and dwarfing rootstocks, grafting, new varieties, pest and insect control, pruning, thinning, and tree-training techniques. However, in both China and Mexico only a small portion of total orange production undergoes commercial treatment at a packing house. Although small segments of the Mexican and Chinese industries could be characterized as modern, the majority of producers would generally be characterized as low technology producers.

Capital

Often the adoption of advanced technologies is linked to producers' access to capital and labor. Where labor is abundant and relatively cheap and access to capital is restricted, production will generally take place with less mechanization and more manual labor. Additionally, access to capital affects a producer's ability to invest in new structures or improve existing ones, such as an enclosed packing facility which reduces dust or a fence surrounding an orchard that keeps out rodents. Such capital improvements can influence a producer's ability to comply with strict food safety requirements imposed by customers or governmental regulations, whether domestic or foreign.

Production in Australia, Spain, and the United States is capital intensive with continued reinvestment in industry infrastructure and replanting. Similarly, increased revenues from export sales have allowed the industries in Chile and Argentina to establish state-of-the-art packing facilities and distribution networks. In Chile, large multinational export companies have invested in growing and packing facilities and often provide annual operating loans to growers. To a limited degree, some Mexican export brokers provide short-term loans to producers and packers for their operations. Some modern facilities exist in the Chinese and Mexican industries, but overall, the state of facilities and equipment in those two countries reflect producers' limited access to capital.

Land

Citrus production in Mexico, China, and South Africa is affected by complex land ownership issues. Land reform in Mexico has resulted in the predominance of small plots of government-awarded land to citrus growers. Lack of education of growers and the inability to benefit from economies of scale hamper export quality production there. Land-tenure insecurity exists in China where farmers do not own their own land, meaning it may not be bought or sold, or used as collateral to secure loans. Because land use rights are not clearly defined, there is little incentive to re-invest or make on-farm capital improvements. It also encourages cultivation on marginal land, and the over-application of fertilizers and chemicals to maximize near-term output. In South Africa, post-Apartheid land reform programs have affected land sales, worker training, and employment/ownership options. There, land and ownership transitions have left many commercially viable farms underutilized due to the lack of education and skills of new owners.[5]

[5] For more detailed information, see chapter 10 (South Africa).

In other countries, citrus production competes for limited land resources. In the United States, Spain, as well as parts of Mexico and China, ongoing urban, commercial and residential development puts pressure on agriculture, including citrus production. Competition with urban growth for water use is also a limiting factor in key U.S. growing regions.

Labor

The abundance of low-cost labor is generally seen as a strength in fresh orange and lemon industries, due to the importance of hand-pruning and manual harvesting of orchards. Relatively inexpensive, abundant labor is generally available in China, Mexico, Argentina, and Chile, and these industries tend to be characterized by more labor intensive production practices. Reportedly, labor availability for the citrus industry is relatively lower in South Africa, Australia, Spain, and the United States. In Australia and the United States, where labor is relatively expensive, growers report that the seasonal nature of citrus production and packing makes it difficult to retain workers. While wage rates in South Africa are relatively low and unemployment is high, the relatively high level of HIV/AIDS and labor intensive nature of the work reportedly leads to labor scarcity. As a result, the productivity of harvest labor has been declining in recent years.

In Spain and China, family labor in citrus production is common. In Spain, on 75 percent of farms, 90 percent of the labor is performed by family members, although the use of employed migrant labor from northern Africa and Eastern Europe is growing. In China, growers and their family members generally perform all work themselves, and only hire labor for pruning, thinning, and harvesting.

To the extent that packing-houses can maintain operations for most of the year by packing other citrus fruit, they are more successful at retaining labor. In the northern growing regions of Mexico, although wages at some in-season packing houses are reportedly double those at maquiladoras, the year-round employment of the maquiladoras draws laborers away from the citrus industry. In Chile, growers have diversified into other crops in part to retain year-round labor. In the main growing region in Argentina, laborers exiting the sugar industry were absorbed by the lemon industry; however, competition still exists for workers.

Scale of Production

Scale of production in fresh market orange and lemon industries is a function of a wide variety of factors, including access to capital (Mexico, China), climate (Chile), or land ownership/acquisition issues (China, Mexico, South Africa). Larger operations can capture economies of scale and efficiencies in the orchard, with regard to efficient use of water flow, irrigation, and equipment, and the efficient use of energy and other resources in the packing-house. Small plot size and/or industry fragmentation can hinder acquisition of new technologies and modern practices, by limiting the ability to spread risk or high fixed costs. Although each producer country has some large-scale operations, small plot sizes predominate in China, Mexico, and Spain. In Spain, some producers have attempted to overcome the disadvantages of small scale by forming linkages with other producers in a cooperative structure.

Productivity and Yields

Yields for fresh market oranges and lemons represent the volume of fruit produced on a given area of land, e.g., the productivity of the orchard. By boosting productivity, producers can increase marketable production without increasing orchard size. Harvested yields represent the total volume of fruit from the orchard usually expressed in terms of bearing hectarage or less frequently, total hectarage. Harvested yields for oranges and lemons, like most agricultural products, depend on a variety of factors such as climate; local soil conditions; tree density; intensity of grove management using fertilization, irrigation, and other inputs; plant age; and disease levels.

High yields are associated with intensely managed production that use advanced technologies. For oranges, this is the case in Australia, South Africa, Spain, and the United States (table 3-1). Yields for lemons are high (20-30 mt/ha) for all producers except in China and Mexico. Even in countries where harvested yields are low in the aggregate, export-oriented producers generally report much higher yields. Large-scale lemon producers in Mexico report yields in the 20-25 mt/ha range, while export-oriented producers in Argentina and Chile report 30-100 mt/ha for oranges and lemons. These high yields, as well as the relatively high industry-wide average in South Africa, are likely a function of high tree densities in these countries.

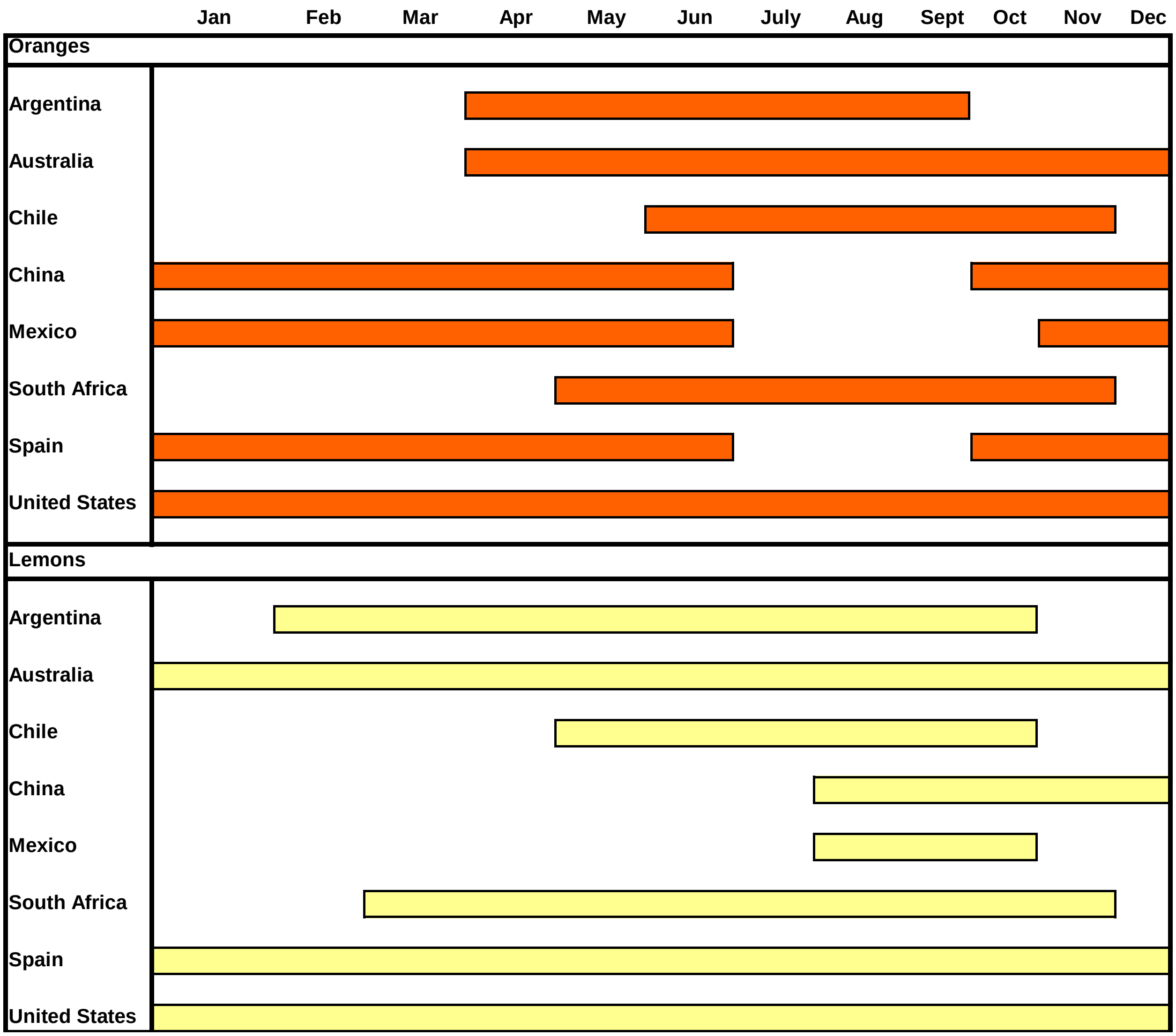
Seasonality

The ability to supply fruit during certain seasonal windows when global supplies are low, and thereby capture higher prices, is a strength for certain orange and lemon producers and is one of the most significant competitive advantages for export-oriented industries. Opposite seasons between the Northern and Southern hemispheres dictate production seasons for fresh oranges and lemons, generally September through March in the Northern hemisphere and May through November in the Southern hemisphere (figure 3-1). Generally Southern hemisphere producers benefit from availability during the opposite season of most high demand markets in the Northern hemisphere.

Ideally, producers would grow oranges and lemons year-round in order to keep a constant supply available to consumers. Toward this end, fresh orange and lemon producers in the United States and all major competitor countries plant multiple varieties with staggered maturity dates and serve foreign markets when domestic production in these markets is in low supply. Additionally, producers may leave fruit on the trees for an additional few months, using growth regulators to maintain fruit quality, and also use cold storage as a way to manage supply and extend their marketing season.

Often, narrow windows of opportunity in key markets drive the development of strong export operations. Mexican exporters have generally shipped lemons to the United States in early August, just before lemons from the new U.S. crop are available. Although U.S. orange exporters ship new crop navels to Japan beginning in November, their prime sales period is February through May when domestic oranges, and imports from Australia and South Africa are no longer available. South African and Australian navel exports are shipped to the United States in the summer months when U.S. navels are no longer available

Figure 3-1 Orange and lemon marketing seasons, by country



Source: Compiled by Commission staff.

and strongly compete with U.S. Valencias, which are becoming unpopular with U.S. consumers due to their small size and greenish coloring.[6]

Business Climate and Foreign Investment

Government policies, such as those relating to business regulation, taxation, and insurance can affect the level of foreign investment in fresh orange and lemon industries. The World Economic Forum publishes an annual ranking of country competitiveness with regard to macro- and microeconomic practices and policies.[7] Although not necessarily indicative of

[6] Interviews with U.S. orange industry representatives, September 28, 2005, Ventura, CA.

[7] The World Economic Forum assesses countries' medium- to long-term growth prospects through its annual Growth Competitiveness Index (GCI). The GCI is a composite of a country's technological readiness, the state of the country's public institutions, and the quality of the country's macroeconomic environment.

the investment climate in the orange and lemon industries, that ranking shows that of a total of 117 countries, the United States and its major orange and lemon competitor countries had the following rankings in 2005: United States (2), Australia (10), Chile (23), Spain (29), South Africa (42), China (49), Mexico (55), and Argentina (72).

For certain countries, foreign investment has played an important role. The Chilean industry has received investment by multinational companies in export operations. Since the deregulation of the South African industry, several large multinationals have invested in export agencies and have backward integrated, owning packing houses as well as orchards. In China, foreign investment and joint ventures between foreign companies and Chinese partners are still not common, but foreign firms from Hong Kong and Macau have recently begun to invest in citrus packer/distributor operations.

Government Support

Neither the U.S. industry nor most of its major competitor countries receive significant government support for their fresh orange and lemon industries. The U.S. industry is supported indirectly through agriculture extension services, soil and conservation programs, and phytosanitary regulation designed to protect domestic production and consumers from harmful pests and diseases. The Australian government matches industry levies for research and development, while in Argentina, limited government support exists mainly for phytosanitary regulation, industry and market information collection and dissemination, and a research program. In China, citrus is considered one of China's advantageous agricultural commodities and there are national and local government initiatives to improve the country's overall global competitiveness through government supported technical assistance, planning, and training. However, China's national citrus plan does not provide funding and overall state financial support for orange and lemon production is believed to be low, although preferential policies may exist at the local level.

In contrast, the Spanish industry benefits from a range of government policies and funding. Under the EU's Common Agriculture Policy, certain EU support programs target fruit and vegetable industries in general, which complicates efforts to determine the level of support received by fresh market orange and lemon producers. There are, however, certain programs specific to orange and lemon production. Producers receive direct payments for market withdrawals, processing subsidies, and export refunds specifically allocated for citrus fruit, along with support through the EU's rural development initiatives.[8]

Exchange Rates

Exchange rates affect not only the price of traded final goods but also input costs of production, particularly where those inputs are largely imported. Bilateral real exchange rates between the United States and Argentina, Australia, Chile, China, Mexico, South Africa, and Spain for the 2000-2005 period are reported in table 3-3. In real terms, the Argentinian peso, Chinese yuan, and Mexican peso depreciated vis-à-vis the U.S. dollar by 41 percent, 7 percent, and 1 percent between 2000 and 2005. In contrast, the Australian dollar and euro appreciated vis-à-vis the U.S. dollar by more than 20 percent, and the South African rand and Chilean peso appreciated vis-à-vis the U.S. dollar by 17 percent and 7 percent, respectively, in the same period.

[8] For more detail information, see chapter 11 (Spain).

Table 3-3 Real exchange rates, selected countries, 2000-2005[a], (foreign currency units per U.S. dollar)

Country	2000	2001	2002	2003	2004	2005
Argentina:						
Argentinian pesos[b]	1.00	1.03	1.73	1.45	1.44	1.41
Australia:						
Australian dollars	1.72	1.90	1.76	1.54	1.39	1.36
Chile:						
Chilean pesos	539.59	595.48	590.98	586.18	535.12	500.79
China:						
Yuans[c]	8.28	8.48	8.47	8.72	8.73	8.84
Mexico:						
Mexican pesos	9.46	8.99	8.64	9.46	9.62	9.57
South Africa:						
Rands	6.94	8.02	8.41	6.25	5.63	5.77
Spain:						
Euros	1.09	1.11	1.02	0.89	0.83	0.85

Source: International Financial Statistics, International Monetary Fund, for nominal exchange rates, line RF, and countries' producer price indices, line 63, for all countries except for China's producer price index for which the source was China's Ministry of Statistics.

[a]Real exchange rates were calculated by multiplying the nominal exchange rate times the ratio of U.S. price to a foreign country price. Exchange rates and prices are yearly averages of nominal exchange rates and producer price indices. An increase in a real exchange rate means U.S. dollar real appreciation or equivalently, foreign currency real depreciation. All price indices are based on the year 2000=100.
[b]Pegged to the U.S. dollar until January 2002.
[c]Pegged to the U.S. dollar until June 2005.

Changes in real U.S. dollar exchange rates have different effects on the competitiveness of navel orange and lemon producers. In Argentina, since abandoning its peg to the U.S. dollar in 2002, the peso has undergone substantial depreciation, likely increasing the country's competitiveness with respect to that of the United States. However, the EU is a more important market for Argentina's citrus products, as it accounted for 70 percent of Argentina's citrus exports in 2004.[9] Nevertheless, depreciation of the peso likely increased Argentina's cost of production somewhat given that an important share of inputs in orange production is imported.[10]

The United States remained Australia's largest export market for fresh oranges in 2005, receiving about 21 percent of total exports.[11] Real depreciation of the Australian dollar vis-à-vis the U.S. dollar has been a factor behind rising Australian orange exports.[12] However, during 2002-2005, the Australian dollar appreciated vis-à-vis the U.S. dollar in real terms, decreasing the competitiveness of the country's citrus exports.[13] Such strengthening of the Australian dollar likely only modestly affected Australia's cost of production.

Except in 2002, the Chinese yuan depreciated vis-à-vis the U.S. dollar in real terms every year during the 2001-2005 period, making Chinese citrus exports more competitive

[9] USDA, FAS, *GAIN Report* No. AR5034, 6.
[10] Chemical inputs, including fertilizers, herbicides, and fungicides and insecticides, account for more than 60 percent of the direct cost of navel oranges, see USDA, FAS, *GAIN Report* No. AR5034, 7. Most of these inputs and natural gas, an important source of energy, are imported and paid in U.S. dollars.
[11] USDA, FAS, *GAIN Report* No. AS5042, 4.
[12] USDA, FAS, *GAIN Report* No. AS4041, 9.
[13] In real terms, the Australian dollar appreciated vis-à-vis the U.S. dollar about 28 percent from 2001 to 2005 (see table 3-3).

compared to those of the United States.[14] However, China's major export markets for fresh oranges continued to be Southeast Asian countries and Russia, which received more than 98 percent of Chinese orange exports in 2004.[15] Since fertilizers and pesticides account for 40 percent of the cost of producing oranges in China, yuan depreciation likely increased such costs. In 2004, the cost of fertilizer alone increased 20 percent.

Chile's peso appreciated in real terms vis-à-vis the U.S. dollar during the 2002-2005 period, decreasing the competitiveness of Chilean products with respect to those of the United States. Chile's major export markets are Japan for oranges and the United States for lemons, accounting for about 55 percent and 58 percent, respectively, of Chile's exports. Although labor accounts for as much as 70 percent of production costs, the real appreciation of the Chilean peso likely decreased the country's cost of production because many inputs are imported including fertilizers and other chemicals.

The Mexican peso appreciated vis-à-vis the U.S. dollar from 2000 to 2002, but depreciated marginally from 2003 to 2005 and remained relatively stable at around 9.6 pesos per dollar during 2004-2005. The United States is the main export market for Mexican orange exports receiving about 10 percent of Mexico's total production,[16] production that is primarily destined for domestic fresh squeezed juice. The recent peso-dollar exchange rate trend did not affect significantly Mexican citrus exports to the United States. Although fertilization and pest control can account for about 40 percent of total orange production costs, since only a small percentage of producers use significant chemical inputs,[17] movements in the real exchange rate between Mexico vis-à-vis the United States likely have had only a modest impact on production costs.

From 2002 to 2004 the South African rand appreciated substantially vis-à-vis the U.S. dollar, but the rand depreciated marginally against the dollar during 2005.[18] The strengthening of the rand has lowered South Africa's competitiveness by making its citrus products less price competitive against those of the United States. Although South Africa's citrus exports to the United States benefit from the African Growth and Opportunity Act (AGOA),[19] its major fresh citrus export destination remains the EU, to which South Africa exported 47 percent of the country's total citrus exports in 2004.[20] The strengthening of South Africa's rand vis-à-vis the U.S. dollar in real terms likely had only modest effects on South Africa's export revenues and on lowering the cost of imported inputs for its production of citrus products.

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[14] In real terms, the Chinese yuan depreciated vis-à-vis the U.S. dollar at an annual average rate of 1.3 percent from 2001 to 2005 (see table 3-3). In nominal terms, however, the Chinese currency appreciated to 8.19 yuan per U.S. dollar in July 2005 from an exchange rate pegged at 8.28 yuan per U.S. dollar until June 2005.

[15] China started to export fresh oranges to the United States in 2004 but the U.S. market only accounted for less than a tenth of one percent of China's orange exports. See USDA, FAS, *GAIN Report* No. CH5084, 15.

[16] USDA, FAS, *GAIN Report* No. MX5043, 9.

[17] USDA, FAS, *GAIN Report* No. MX4136, 10.

[18] From 2002 to 2005 the South African rand appreciated vis-à-vis the U.S. dollar by 31 percent in real terms (see table 3-3).

[19] AGOA provides duty free treatment for certain imports, including oranges and lemons, into the United States from sub-Saharan African countries. For more information, USITC, *The Year in Trade 2004*, 2-17.

[20] USDA, FAS, *GAIN Report* No. SF5016, 8.

Regulations

Orange and lemon producers must comply with a wide variety of regulations regarding food safety, product quality, environmental stewardship, and social standards (such as labor protections, workers' compensation, and land ownership), and regulatory compliance affects producer performance and costs. Some regulations and standards are mandatory and imposed by the domestic authorities or foreign governments, while others are voluntary and imposed by the marketplace. Lack of data makes it difficult to assess the costs and benefits of the regulatory environment for orange and lemon producers in the United States and other countries.

Regulations reflect, among other factors, demand by consumers for safer and higher quality products, and concern for social issues and the environment. Specifically, fresh orange and lemon production involves compliance with packing and processing hygiene requirements; sanitation and fumigation requirements; limits on pesticide use and residues, and microbiological pathogens; grading standards; and packaging and labeling requirements. Trade in citrus also involves considerable regulation with regard to country-specific sanitary and phytosanitary (SPS) requirements, which are designed to prevent the spread of pests and diseases across regional, state or country borders.

The production of produce such as fresh oranges and lemons, with multiple handling by humans, faces increasing scrutiny by regulators for improved food safety and traceability measures. Food safety regulations affect practices at the farm and packing level, where sites of potential contamination include fertilizers, irrigation water, harvesting equipment, and handling, but also throughout the distribution chain where temperature changes and exposure to contaminants could make food unsafe. While governments generally impose food quality and safety standards, retailers and consumers often demand even more stringent standards regarding food safety.

Environmental regulations imposed upon producers and their level of enforcement vary widely. Producers in different regions of the same country can face different requirements and costs. The United States ranked 14th in Esty and Porter's environmental regulation regime index (ERRI).[21] The U.S. orange and lemon industries' major competitors rank below the United States in the following order: Australia (16th), Spain (21st), Chile (25th), South Africa (32nd), China (44th), and Argentina (51st). While a higher ranking in the index indicates a stronger set of environmental regulations, and associated costs, Esty and Porter have found that environmental progress is not necessarily achieved by sacrificing competitiveness.[22] Coyler's academic research states that the negative consequences for costs and competitiveness associated with increased regulation, are "often mitigated through subsidies that enable agriculture to remain competitive in export markets."[23] Coyler's research also hypothesizes that, even in situations where regulatory requirements are similar in two countries, "competitiveness may be affected if one country is more efficient in carrying out its regulatory regime or does not enforce it equally." Developing countries tend

[21] The ERRI combines the measures of regulatory stringency, structure, subsidies, and enforcement and represents the quality of the environmental regulatory system in a country. Esty and Porter, "Ranking National Environmental Regulation and Performance," 95.

[22] Ibid.

[23] Countries may attempt to mitigate the effects of their environmental regulations on costs though various types of subsidies or incentives, such as faster tax write-offs for pollution abatement equipment. Coyler, "Environmental Regulations," 72.

to have less stringent environmental regulations than higher income developed countries. However, the competitiveness of some developing countries is considered to be more closely related to their lower land and labor costs than to less stringent environmental regimes.[24]

Market Standards

The demands of the marketplace for food safety and hygiene standards, which can range from acceptable chemical residues levels on fruit to cleanliness in the packing-house, have resulted in customer-imposed standards that can exceed government requirements. Although they are voluntary, meeting these standards has generally become a de facto prerequisite to doing business with retail or food service companies in most countries. In response, producers in the United States and most export-oriented producers in major competitor countries devise their own food safety programs which they then submit to third-party auditing.[25] Third-party auditing can be done according to any recognized set of standards. Although there are no agreed-upon and regulated U.S. market standards, there are accepted standards, such as those instituted by the U.S. Food and Drug Administration and various state-level departments, including Good Agricultural Practices (GAPs), Hazard Analysis and Critical Control Point (HACCP), and Good Manufacturing Practice (GMP).[26] In Europe, standardization of GAPs has resulted in EurepGAP standards.[27] Third-party audits are becoming as common in other countries as they are in the United States and Europe.[28] Export-oriented fresh orange and lemon producers in Argentina, Chile, and South Africa reported that they are EurepGAP certified.[29]

While most citrus industries that export globally generally comply with quality requirements in major export markets, only small portions of the Chinese and Mexican orange industries are able to do so.[30] U.S. imports of Mexican oranges from certain regions affected by fruit fly infestations are less likely to meet quality standards since they must be fumigated, which lowers fruit shelf-life. This limits sales to U.S. regions close to the Mexican border. Industry observers indicate that China's biggest obstacle to competing in the world market is its difficulty in meeting food safety and hygiene standards in most destination markets.[31]

Production Costs

Given a comparable level of product quality, lower relative input costs of production can increase a producer's competitiveness. As noted, direct input costs in the citrus orchard generally include rootstock for replanting, water, fertilizers, chemicals (herbicides, pesticides, insecticides, and growth regulators), labor, and energy. Beyond the orchard, costs include harvesting (or 'pick and haul'), packing, marketing and transportation to market. Producers also incur fixed costs such as insurance, taxes, the depreciation of equipment,

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[24] Ibid., 90.

[25] In the United States, the main fresh produce audit companies are Primus Labs, Davis Fresh Technologies, the American Baking Institute, and the USDA, which has a commercial auditing service.

[26] HACCP and GMP refer to the U.S. Food and Drug Administration's primary food safety program.

[27] EurepGAP (Euro Retailer Group for Good Agricultural Practices) refers to standards established by European retailers to offer high quality food products grown and certified under protocol and complying with specific standards. Standards may vary according to requirements within each production area.

[28] Linden, "Third Party Audits Are Part of the Landscape," 11-12.

[29] USITC fieldwork and interviews with Argentine, Chilean, and South African industry representatives, December 2005 and January 2006.

[30] For additional information, see chapters 8 (China) and 9 (Mexico).

[31] For additional information, see discussion in chapter 8 (China).

buildings, or land and other opportunity costs, as well as costs related to standards and regulatory compliance, either publicly or privately imposed. The comparison of such costs is a useful tool for producers, researchers, and policymakers.

Methodological Considerations for Cost Comparisons

A number of data and practical complications arise when making production cost comparisons in agriculture, especially for tree crops such as oranges and lemons. Comparing agricultural costs of production poses special challenges because it requires identifying identical products under identical circumstances. Rarely are such cost data and information available. Comparisons across international markets are further complicated by a number of additional considerations, including inter-country differences in the use of production technologies, government policies, and cost accounting practices. Such data complications have not been overcome in this study. The challenges of agriculture production cost comparisons are widely documented in the academic literature and underscore that any cost comparisons should be considered with caution. A report published by a task force organized by the American Agricultural Economics Association (AAEA)[32] summarizes these issues, as follows.

- **Use of different terminologies, definitions, and measurement methods**

  Different countries and country institutions use various terms and concepts to define production costs, and differ by the format and measurement techniques used to compile costs. For example, cost categories, such as direct and indirect costs, and individual inputs, such as labor, may be defined and measured differently across countries. Some cost information is based on limited sampling information and computed costs, whereas other cost information is compiled from large-scale surveys. Reported cost data will also differ based on how they conform to accepted statistical standards and how users of this information judge the "reasonableness" of the data.

- **Presence of policy-induced product and input price distortions**

  Most governments use a range of agricultural support and macroeconomic policies that often result in market distortions affecting input and output prices.[33] Examples include commodity price supports, input subsidies, border subsidies, quotas, taxes, tariffs and duties, and exchange rate controls. Such policies may result in lower production costs in some countries compared to others, but may also affect the quantity of the input used and the quantity and form of the output. Capturing the effects of these policies on costs is difficult, especially for some forms of indirect assistance, such as transportation and communication subsidies.

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[32] AAEA, "International Comparisons," 11-2. Issues identified by the AAEA report include: terminologies, definitions, and concepts; policy-induced product and input price distortions; exchange rates and inflation; exclusion and unaccounted costs; product and input definitions; measurement issues; technological differences; and financial accounting versus economic costs and returns.

[33] OECD, "Agricultural Support." Objectives are wide-ranging, including supporting farm incomes, securing safe food, and ensuring environmental quality. The magnitude of the effects varies considerably among different domestic support policies. See: Westcott and Young, "U.S. Farm Program Benefits," 10-14.

- **Adjusting costs to account for inflation and exchange rates**

  Selecting an appropriate exchange rate and adjusting for inflation is necessary to express costs in a common currency. However, some reported country statistics may be unavailable or may be unreliable. Some countries may have both an official and unofficial (black market) exchange rate. Inflationary and monetary instability may complicate a comparison of costs.[34] Addressing price inflation can be problematic depending on the need for production cycle and inter-seasonal adjustments, especially in countries with rapid increases in inflation.

- **Exclusion and non-accounting of certain costs**

  Some countries may include (exclude) costs that may (may not) be accounted for in others. For example, some country costs may include allowances for general farm overhead and owner-operator opportunity costs, while others may not. The inclusion or exclusion of certain costs may result from conceptual and cultivation differences among countries. Costs also will differ depending on the level of production technology and the types of production inputs used within a country.

Limitations of Available Cost Data

For this study, the main limitations of the available cost information include differences in data sources (e.g., surveys versus accounting models) and incompleteness of cost information. These limitations complicate a comparison of total costs across the eight countries analyzed in this report. The cost information presented in this study should be viewed with these caveats in mind.

In this report, cost data are grouped into three broad categories: farm-level costs, packing house costs, and other costs such as for transport and marketing. Farm-level (growing) costs for citrus include irrigation, fertilizer and pesticides/herbicides, pruning, equipment use, harvesting, and other costs of producing citrus crops on the trees. Packing costs include commercial treatment (e.g., washing, waxing, grading, labeling, color-added, and packaging), marketing, and may include harvesting ('pick and haul'). Costs associated with transport to port include marketing, storage and handling, and other miscellaneous shipment and transportation fees (excluding actual freight costs).

Cost data presented here differ widely not only by source, but by format, reporting years, and type of production facility represented by the data. Additional limitations are evident on a country-by-country basis, as documented in tables 3-4, 3-5, and 3-6 and as discussed in the individual country profiles of this report. Because of these limitations, the cost data and information presented here should be regarded as illustrative only, and should not be used for purposes of making direct cost comparisons among countries.

Production cost data for oranges and lemons is not widely available, and the Commission relied on published sources for a limited number of countries (table 3-4). The differences in data sources relate not only to their statistical representativeness but also to the type of

[34] See, for example, Muraro, Spreen, and Roka, "Impact of the 1999 Brazilian Devaluation."

Table 3-4 Oranges and lemons: Sources of farm and packing cost information

Country	Source
Argentina	Farm-level • Cost information for navels were compiled by Commission staff from periodic surveys published by the Instituto Nacional de Tecnología Agropecuaria (INTA), reflecting mid-sized orchards growing for export in the Entre Rios province (year-end 2005). • Cost information for lemons is from Commission field visits and interviews with Argentina's largest producers and exporters in Tucaman province (year-end 2005). Packing/Shipping • Cost information is from Commission field visits and interviews with packers of Valencia oranges and large-scale lemon packing operations, with 35-50 percent intended for export.
Australia	Farm-level • Cost information is from enterprise budget data. Orange sample costs are for three producing regions compiled for the Australia Government's Productivity Commission (2002). Lemon sample costs are for a growing area in New South Wales compiled by that region's Department of Primary Industries (2003). • Enterprise budget contain sample costs, often based on both surveyed information and computed estimates, intended as guidelines for projecting/comparing costs and returns. • Labor costs are not separated out from sample cost components. Packing/Shipping • Available packing cost information is from the Australia Government's Productivity Commission for orange (navel and Valencia) facilities only.
Chile	Farm-level • Cost information for oranges and lemons were obtained from Commission field visits and interviews with Chilean producers and exporters (year-end 2005). • Data are considered typical of larger growers and packers producing fresh citrus on mid-sized orchards for export, using appropriate agricultural and post-harvest practices. Packing/Shipping • Available packing and marketing costs were obtained for lemon facilities only.
China	Farm-level • Surveyed average cost and returns information for mandarin oranges published annually by China's National Development and Reform Committee (2004). • Data represent average national costs and average costs in select major growing regions. • Cost data for lemons are not available. Packing/Shipping • Packing and shipping costs are not available. Packing costs are approximated from estimated marketing margins between farm-level costs and reported market prices.
Mexico	Farm-level • Farm costs for oranges were compiled by Commission staff from field visits and interviews with Mexican growers in Sonora in Northwestern Mexico, reflecting small-scale and mid-sized grower operations (year-end 2005). • Farm costs for lemons were compiled by Commission staff from field visits and interviews with Mexican growers in the Ciudad Victoria region of Tamaulipas, reflecting mostly large-scale, high-technology production (year-end 2005). Packing/Shipping • Packing costs for oranges and lemons were compiled by Commission staff from field visits and interviews with Mexican citrus industry officials growers, reflecting costs for large-scale, export-oriented operations (year-end 2005).

Table 3-4–*Continue* Oranges and lemons: Sources of farm and packing cost information

Country	Source
South Africa	Farm-level • Farm costs for oranges are based on survey information compiled by South Africa's Citrus Growers Association (CGA), supplemented by other industry cost information. Costs reflect general conditions at export-oriented operations in the Western Cape (year-end 2005). • Cost data for lemons are not available. Available costs for oranges and other citrus production are considered to approximate growing costs for lemons. Packing/Shipping • Packing costs are based on available information for citrus products from survey information from CGA and other industry officials, reflecting conditions at export-oriented Western Cape packing facilities (year-end 2005).
Spain	Farm-level • Surveyed average cost and returns information for oranges and lemons are from published sources by researchers at the Polytechnic University of Valencia (2000-2005). • Data reflect conditions at orange and lemon farms with small landholdings in the Valencia region, in some cases using different production and irrigation systems. Packing/Shipping • Limited packing cost information is from surveyed operations regarding harvesting and warehouse transport costs for lemons. Shipping costs are not available.
United States	Farm-level • Cost information for oranges and lemons is from enterprise budgets for San Joaquin, California, compiled by farm advisors at the University of California at Davis (2005). • Enterprise budgets contain sample costs, often based on both surveyed information and computed estimates, intended as guidelines for projecting/comparing costs and returns. • Labor costs are not separated out from sample cost components. Packing/Shipping • Packing costs are from enterprise budget information, corroborated by average packing costs provided by Sunkist Growers.

production facility represented by the data. Most of the formal survey data compiled by government agencies or university researchers reflect average conditions across all operations, including high-performing operations with low per-unit cost operations and small-scale orchard operations. Given that the majority of agricultural producers in most markets tend to be small-scale operations, this means that the average survey data are likely skewed toward smaller-scale orchards. In some countries, small-scale orchards may have low overall costs since production relies on few purchased capital inputs and modern production technologies; instead, production is often labor intensive, especially in countries where labor is relatively abundant and inexpensive. As a result, the reported average cost data may reflect more labor-intensive, low-technology orchards and may understate higher costs at more advanced, large-scale capital intensive operations. The costs presented for China and Spain could fall into this category.[35] In contrast, enterprise budget data can be skewed toward the least-cost orchard operations, because of their usual use as a guide for the efficient operation of citrus orchards. This may characterize the costs presented for the United States and Australia.

[35] Spanish cost data for 2003 are based on small test plot data corroborated by large-scale survey data for 2000.

The cost data presented for Argentina, Chile, South Africa likely reflect conditions at larger-sized, mostly export-oriented operations. Cost data presented for Mexico represents a broader mix of operation types. However inconsistent across countries these sources are, they were the only data available for use by the Commission for this report.

Cost data presented below also differ according to the reporting year. Surveyed information for China (2004), Spain (2003 and 2004), Argentina (2005, lemons), and South Africa (2005) are based on actual production conditions during the years they were collected. Information provided by industry representatives as a part of Commission fieldwork for this study generally reflect conditions as of year-end 2005 (Mexico, Chile, and Argentina (oranges)). Enterprise budget data are generally not associated with a particular production cycle, although data may reflect conditions for a certain period to the extent that survey information is collected to inform the budget compilations.[36] Sample costs for the United States and Australia were published in 2005 and 2002, respectively.

Other variations should be noted. For example, there are also inconsistencies in the definition of cost items.[37] For example, some sources include the interest on working capital, others do not. Some break out labor, while others include labor in a single cost of the activity in question (e.g., irrigation). The cost data for Spain include estimates of opportunity costs, which reflect land rent and interest costs.[38] This report treats farm and processing costs as accounting data, and estimated values, such as opportunity costs, are not included in the total farm-level costs.

Labor data are also problematic when family labor, for example, is reported by some farms and not others. Reported labor costs typically do not include labor costs of the farm owner-operators, although farmer labor is explicitly reported in the cost data for China. In this case, the opportunity cost of the farmer's labor is the net income foregone by not being employed in another occupation. Because most countries do not explicitly report farm labor costs, these costs are excluded from estimates of China's total farm-level costs. However, such costs may be included in some of the cost information for other countries, but not explicitly stated. For example, the labor costs for some countries, such as Chile, appear somewhat high relative to the countries with similar growing portfolios. This might be explained by the inclusion of owner labor costs as part of its total reported labor costs.

Certain other input costs, including harvesting costs, are also addressed differently among the sources. Traditionally, fruit was harvested by the farmer and costs associated with

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[36] Data for enterprise budget analysis are based on actual data collected by growers or processors, but, depending on their intended use, they may be averaged and/or presented as best–case scenarios and therefore may not necessarily reflect the actual operations of any grower or processor (given differences in management levels, soils, weather, prices received, prices paid, fertilization and cultural practices) or average costs across a range of agricultural producers.

[37] See individual country profiles (chapters 4 through 11) for country production cost tables with breakouts and further discussion.

[38] From an economic standpoint, the opportunity (or economic) costs of growing tree crops entail a variety of foregone income by not using the land, labor, or other inputs in their next-best employment. For example, in the case of land that is owned by the farmer, the opportunity cost is the forgone income that could be earned by growing a more profitable crop or by renting the land to someone else. These economic costs are not usually quantified and sometimes are not readily quantifiable, even though they exist in an abstract sense. If an alternative use of citrus land or labor could bring in greater net income, then there is a "cost" (greater foregone revenue) resulting from its use in less lucrative citrus production. In this case, the opportunity cost of citrus land is the net revenue that could have been obtained by growing tree nuts, or annual crops such as vegetables. If land is leased, the opportunity cost of land is the cost of using the land.

harvesting were incurred by the farmer. Now, in more vertically integrated industries, harvesting is often arranged by the packer using packing house or contract labor; however, a portion of an orchard may be harvested by the farmer. In such cases, where harvesting costs are not explicitly itemized, such costs reported by farmers and packers could be double counting. For this reason, harvesting costs are not presented as a separate cost category for most countries in this report. Other input costs, such as fertilizer, pesticides, and herbicides, are listed separately in some cost data and combined as "chemicals" in others. These distinctions are described in more detail in each country chapter.

Production outputs differ as well. Available cost data and information do not refer strictly to identical citrus fruits in all cases. Some countries, such as the United States, Argentina, Chile, and Australia, report cost data for navel oranges and Lisbon variety lemons. Other country data are more limited. For example, cost data for Spain cover oranges, both navels and Valencias, and data for China include all oranges, including orange-mandarin hybrid varieties. Comparable cost data for Mexico are also difficult to obtain given that Valencia oranges and limes are the predominant citrus varieties grown. Citrus costs for South Africa are also supplemented by information for other citrus varieties. Cost data are not available for lemon production in China and South Africa; however, Commission interviews with farmers in these countries who grow both oranges and lemons indicate that there are not substantial differences in average grower costs for these fruits.[39]

Among the more obvious omitted cost information is the exclusion of inter-temporal costs for tree crops, such as orchard establishment costs.[40] Tree crops require establishing an orchard and planting trees, which means that expenditures may occur up to 5-7 years before trees start bearing fruit. Orchard establishment costs include costs for land acquisition, land preparation, tree planting, and tree care during this period. These costs are not necessarily current cash outlays (except perhaps for interest paid on outstanding loans for initially establishing the orchard), but, properly amortized and discounted, are part of the cost of any given year's citrus harvest. However, the omission of these costs in most of the countries' data is probably of little consequence to this analysis. In the case of long-established orchards, including most U.S. citrus orchards and orchards in most of the countries considered here, the initial costs of setting up the orchard have likely been fully amortized. Even at an established orchard, trees die and trees are planted each year, resulting in a continuous annual expenditure for tree planting and care prior to fruit production. Such outlays are generally included in the farm-level data reported in this study.

Finally, the cost data below differ by country in terms of the completeness of information for each of the major cost categories, e.g., farm-level and packing costs. The most complete category is for farm-level costs, with the exception of lemon production in China and South Africa. Available information on citrus packing facilities in these countries is more limited and vary widely. There are considerable differences among countries in the level of commercial treatment of citrus fruit. Packing houses in some countries are also more actively engaged in harvesting than other countries, which may complicate cost comparisons. The degree of marketing and promotion by the packing house also varies. For the United States and Australia, reported packing costs are based on published cost

[39] Interviews with Chinese citrus industry officials, February 25, 2006, Sichuan, China; interviews with South African industry association representative, January 18, 2006, Western Cape, South Africa.

[40] Available cost data for the United States includes a full accounting for orchard establishment and tree plantings over a multiple year start-up period; however, due to the unavailability of similar data on foreign production, the costs presented in this study reflect only the reported annual costs to produce citrus.

information, in some cases corroborated by other industry information obtained from Commission field work. For Spain, there is limited published information on the cost for harvesting and transportation to warehouse, which may not reflect full packing house costs. For Argentina, Chile, Mexico, and South Africa, packing cost information was obtained from Commission field work and, in some cases, is supplemented by compiled cost data from national industry membership organizations. The Commission was not able to obtain cost information for citrus packing facilities in China.

Summary of Production Costs for Selected Countries

Available cost information is grouped into farm-level (growing), packing, harvesting, and other costs (tables 3-5 and 3-6). At the farm-level, cost information is provided on both a per-hectare and per-mt basis. Per-unit cost information is typically based on reported production output or yield associated with the reported cost data. Because of the aforementioned data complications and limitations, this report simply presents these cost data and information, but does not attempt to categorize this information into low and high cost producers.

On a per-unit basis, total reported costs for oranges range from $261/mt in Mexico to $570/mt in the United States. Total costs, however, cannot be determined for all countries because of limitations with available cost data. Farm-level costs (excluding owner labor) for oranges range from $51/mt in Argentina to $153/mt in the United States. Orange packing costs range from $100/mt in Mexico to about $200/mt in Chile, South Africa, and the United States. Limited information for Australia shows higher average citrus packing costs at about $270/mt.

For countries where total costs for lemons are available, total costs range from about $338/mt in Mexico to more than $640/mt in the United States. No costs are available on lemon production and packing in China and South Africa, and only limited packing cost information is available for Australia. Farm-level costs range from about $40-60/mt in Argentina and Mexico to $165/mt in Spain. Packing costs range from about $200/mt in Chile to about $260/mt in the United States.

Producer Prices

In addition to producers' costs reported above, the Commission employed different metrics, such as average unit values (AUVs) and revealed comparative advantage, to assess the strengths and weaknesses of fresh orange and lemon industries. Although these metrics may not provide consistent assessments, the use of multiple tools provides a comprehensive view of the global competitive situation. Export AUVs (FOB) should, to some extent, reflect production costs given that export AUVs comprise the production and other costs incurred by the exporter and the rate of return earned by the exporter.[41] However, exporters' rates of return can and do vary widely in response to supply and demand conditions and other factors. In these cases, export AUVs may not accurately reflect producer costs. Major

[41] AUVs are not prices. However, AUVs provide an imperfect proxy for prices since pricing data are not available. "Free-on-board" (FOB) refers to the obligation by the seller to pay for delivery of goods to the port of shipment as well as loading costs. This differs from "cost, insurance and freight" (CIF) requiring the seller to pay for the cost of the goods, the transport costs to the destination port, and the cost of marine insurance. Comparisons of average unit values of imports (CIF) in destination markets are presented later in this chapter.

Table 3-5 Oranges: Cost comparison by input or activity, by producing country

Cost item	U.S. 2005	Argentina 2005	Australia[a] 2002	Chile 2005	China 2004	Mexico 2005	S. Africa 2005	Spain[a] 2003
	Dollars (per hectare)							
Farm-level costs:	4,360	1,570	3,390-4,610	6,400	3,310	1,300	4,180	2,680-4,410
Labor[b]	[c]1,740	520	1,870-1,970	[d]4,480	1,140	780	1,120	830-1,370
Chemicals[e]	[c]1,120	530	630-700	na	1,650	100	780	610-1,160
Other economic costs[f]	na	na	na	na	840	na	na	na
	Dollars (per metric ton)							
Farm-level costs	153	51	68-132	160	115	65	139	117-147
Packing costs	191	164	[g]268	194	na	100	192	na
Harvesting costs	62	73	([h])	([h])	([h])	40	([h])	([h])
Other post-harvest costs[i]	[j]164	132	na	na	na	56	175	na
Total costs	570	421	[k]na	354	na	261	505	na

Sources: Compiled by Commission staff from a wide range of country-specific sources (described in Table 3-4). More detailed source information by country is provided in the country profiles (chapters 4-11). Farm-level costs are round to nearest tens. Totals may not add due to rounding. “na” indicates data are not available.

Notes: Due to the limitations of the cost data, these costs should be regarded as illustrative only and should not be used for purposes of making direct cost comparisons.

[a]Cost ranges reflect different growing regions in Australia and different production systems in Spain. For Australia, farm-level costs include both direct and indirect costs converted to a dollar/hectare basis.

[b]Labor costs are not always itemized, but are included as part of the overall costs for tasks such as pruning, orchard practices, or chemical applications. Some labor cost data likely include labor for fruit harvesting (e.g., Australia, Chile, China, South Africa, and Spain); while other cost data do not (e.g., United States, Argentina, Mexico).

[c]Estimated by Commission staff.

[d]Reported labor costs are high compared to those reported for other countries and may include other labor costs such as management labor and/or labor for other aspects of production, including harvesting.

[e]Chemical costs include fertilizers, pesticides/insecticides, herbicides, fungicides, growth regulators, and other chemical inputs, and may include application costs.

[f]Represents Chinese owner-operator labor.

[g]Packing costs are based on reported average orange packing costs during 1997-1998.

[h]Harvesting is likely included as part of farm-level costs.

[i]May include marketing and export costs, inspection fees, handling charges, and overhead costs, depending on the available cost information.

[j]Includes some overhead expenses not attributed specifically to either growing or packing.

[k]Cannot be summed due to difference in data sets.

Table 3-6 Lemons: Cost comparison by input or activity, by producing country

Cost item	U.S. 2005	Argentina 2005	Australia 2003	Chile 2005	China 2004	Mexico 2005	S. Africa 2005	Spain 2003
	Dollars (per hectare)							
Farm-level costs:	4,520	1,935	[a]3,150	8,600	na	1,400	na	5,760
Labor[b]	[c]1,980	377	1,640	2,000	na	350	na	1,610
Chemicals[d]	[c]990	743	1,130	2,000	na	800	na	1,410
Other economic costs[e]	na	na	na	na	na	na	na	1,290
	Dollars (per metric ton)							
Farm-level costs	116	40	126	143	na	56	na	165
Packing costs	261	na	na	203	na	222	na	[f]224
Harvesting costs	145	44	([g])	([g])	na	60	na	[f]118
Other post-harvest costs	[h]121	[i]75	na	na	na	na	na	na
Total costs	643	na	na	347	na	338	na	na

Sources: Compiled by Commission staff from a wide range of country-specific sources (described in Table 3-4). More detailed source information by country is provided in the country profiles (chapters 4-11). Farm-level costs are round to nearest tens. Totals may not add due to rounding. "na" indicates data are not available.

Notes: Due to the limitations of the cost data, these costs should be regarded as illustrative only and should not be used for purposes of making direct cost comparisons.

[a]Includes both reported direct and indirect costs, converted to a dollar/hectare basis.

[b]Labor costs are not always itemized, but are included as part of the overall costs for tasks such as pruning, orchard practices, or chemical applications. Some farm cost data likely include labor for fruit harvesting (e.g., Australia, Chile, China, South Africa, and Spain); while other cost data do not (e.g., United States, Argentina, Mexico).

[c]Estimated by Commission staff.

[d]Chemical costs include fertilizers, pesticides/insecticides, herbicides, fungicides, growth regulators, and other chemical inputs, and may include application costs.

[e]Includes Spain's farm opportunity cost based on land rent and interest costs.

[f]Harvesting and packing costs are based on more recently reported average lemon data from 2004-05.

[g]Harvesting is likely included as part of farm-level costs.

[h]Includes some overhead expenses not attributed specifically to either growing or packing.

[i]May include marketing and export costs, handling charges, and overhead costs, depending on the available cost information.

competitor countries' fresh orange export AUVs were highly variable during 2000-2005 (table 3-7). Since export AUVs are annual averages across all exports, they can fluctuate widely across years for various reasons, including crop quality and traded volumes. The highest unit values in 2005 were associated with leading volume and value orange exporting countries, including Spain, the United States, and Australia. These exporters also experienced rising AUVs over the period in their main markets, e.g., primarily high income markets such as the EU, North America, and Asia, which pay high prices for quality fruit. In contrast, South Africa, which experienced the greatest growth in the volume and value of exports among leading exporters, had the lowest AUVs. South Africa's AUVs declined marginally over the period, as its volume of exports more than doubled during 2000-2005. Among other major competitor countries, export AUVs of fresh oranges generally were lower than those of leading exporters, suggesting that low AUVs do not necessarily translate to strong export performance.

Table 3-7 Fresh oranges: Average unit values of exports (FOB), by country, 2000-2005 (dollars/mt)

Reporting country	2000	2001	2002	2003	2004	2005
Spain	421	484	539	666	763	781
Australia	574	568	608	745	791	741
United States	544	581	590	541	611	658
Chile	515	562	549	569	563	560
China	162	155	386	367	362	335
Argentina	373	379	207	288	311	275
Mexico	369	252	273	233	228	253
South Africa	243	204	197	303	381	195

Source: Global Trade Atlas.

The fresh lemon market,[42] in contrast to fresh oranges (particularly navels), is regarded as a commodity market, as consumers of lemons generally do not distinguish among varieties. In general, the leading exporters in terms of total volumes and values, Argentina and South Africa, had the lowest AUVs (table 3-8). Moreover, for both countries, their AUVs declined during 2000-2005 as supplies increased in the global market. Australia and the United States, whose export volume of lemons declined over the period, had the highest export AUVs, which also trended upward during the period.

Table 3-8 Fresh lemons/limes: Average unit values of exports (FOB), by country, 2000-2005 (dollars/mt)

Reporting country	2000	2001	2002	2003	2004	2005
China	804	370	366	261	382	948
Australia	750	757	832	947	895	817
United States	679	663	785	748	715	780
Spain	492	478	500	643	668	778
Chile	754	722	739	630	570	548
Mexico	278	443	227	352	502	500
Argentina	461	445	326	388	406	403
South Africa	323	269	245	370	488	177

Source: Global Trade Atlas.

Average unit values of imports in destination markets can provide an indication of the price of the good in the destination market and can be a useful indicator of producers' relative performance because all production, marketing,[43] and transportation costs are included. Import AUVs presented below are derived from trade data, are reported on a CIF basis, and reveal that among leading markets there are a limited number of supplying countries (tables 3-9 and 3-10). In most cases 2 or 3 countries supply over three-quarters of imports.[44] The data show price variability among suppliers in certain markets. This may indicate that a country is a higher-cost supplier due to production or shipping costs, or may indicate a higher quality product or more desirable variety. This is particularly the case for oranges.

[42] Harmonized trade data on AUVs is only available for lemons/limes. However, with the exception of Mexico, which is a large exporter of limes, the AUVs listed in table 3-8 can be considered to apply to lemons since the major competitor countries are principally producers and exporters of lemons.

[43] Marketing costs are included in the cost of the good.

[44] Certain countries, particularly the EU, import fresh oranges and lemons from other regional suppliers that are not part of the study, such as Turkey, Egypt and Morocco.

Table 3-9 Fresh oranges: Average unit values of imports (CIF), by market, 2005 (US dollars/mt)

Market	United States	Spain	South Africa	Chile	Australia	Mexico	Argentina	China
United States[a]	-	([b])	1,139	([b])	1,048	463	([b])	([b])
EU-25	644	-	582	609	699	([b])	494	([b])
Germany	([b])	602	657	([b])	([b])	([b])	([b])	([b])
United Kingdom	594	734	593	([b])	774	([b])	296	([b])
Japan	960	([b])	488	822	1,024	([b])	([b])	([b])
South Korea	1,157	511	915	([b])	1,157	([b])	([b])	([b])

Source: Global Trade Atlas.

[a]Customs value.
[b]Due to imports of less than one metric ton in the market, an average unit value could be skewed and was therefore not calculated.

Table 3-10 Fresh lemons/limes: Average unit values of imports (CIF), by market, 2005 (US dollars/mt)

Market	United States	Spain	South Africa	Chile	Australia	Mexico	Argentina	China
United States[a]	-	771	([b])	530	([b])	420	([b])	([b])
EU-25	846	-	767	([b])	([b])	([b])	743	([b])
Germany	([b])	905	([b])	([b])	([b])	([b])	726	([b])
United Kingdom	([b])	884	767	([b])	([b])	1,136	752	([b])
Japan	1,267	([b])	491	995	([b])	([b])	720	([b])
Russia	([b])	538	533	([b])	([B])	([b])	532	([b])

Source: Global Trade Atlas.

[a]Customs value.
[b]Due to imports of less than one metric ton in the market, an average unit value could be skewed and was therefore not calculated.

In the U.S. market, import AUVs for South African and Australian oranges are over $1,000/mt, primarily because these are high quality navel oranges, which supply the counter-seasonal U.S. market. In contrast, oranges from Mexico have lower unit values, less than $500/mt, likely because they are primarily the less desirable Valencia variety, which are supplied at the height of the U.S. marketing season.[45] Similarly, in Japan, imports from the United States and Australia are mainly higher value navel oranges, compared to South Africa, which supplies Valencia varieties to this market.

Lemon import AUVs values are less variable in most markets, suggesting they are less differentiated products compared to oranges; fresh-market lemons are mainly used as a cooking ingredient or a garnish. When types and qualities are equivalent, which is generally the case for lemons, import AUVs are a better indicator of price performance among suppliers.

Comparative Advantage of Exports

The revealed comparative advantage index (RCA) is often used in the agriculture and international economic literature to estimate the comparative advantage in the production of a good even though that agricultural commodity may not be among the country's key

[45] Also, Mexico generally has lower shipping costs. However, most of the import AUV variability is likely due to differences in quality and variety, since some imported oranges from Mexico are sold for processing in the United States.

exports.[46] The symmetric RCA (SRCA) is an RCA converted into a value between -1 and +1, with a high positive value indicating a high degree of comparative advantage, and a high negative value indicating a lack of comparative advantage.[47] RCA and SRCA values are determined by a country's exports relative to global exports in a given year and, therefore, can change over time. The SRCAs for the United States and other competitor countries (table 3-11) may indicate each industry's export competitiveness in each product.

Table 3-11 Fresh oranges and lemons/limes: Symmetric revealed comparative advantage (SRCA) for selected countries, 2004[a]

Product	U.S.	Argentina	Australia	Chile	China	Mexico	South Africa	Spain
Oranges	0.1	0.2	0.5	-0.8	-0.8	-1.0	0.7	0.5
Lemons/limes	-0.2	0.8	-0.9	-0.2	-1.0	0.5	0.5	0.4

Source: Derived by Commission staff from Global Trade Atlas export data.

[a]High positive values indicate a high degree of comparative advantage in producing the product; high negative values indicate a low degree of comparative advantage in producing the product.

Countries that export a greater share of oranges or lemons relative to that country's total fruit and vegetable exports when compared to the global share of oranges or lemons relative to global trade in fruits and vegetables have a positive, higher value SRCA, and are considered to have a comparative advantage in orange or lemon production. Those with smaller relative shares of orange and lemon exports have negative, lower value SRCAs, and are considered to lack comparative advantage in production. As the SRCA values indicate in table 3-11, Argentina, Australia, South Africa, Spain, and the United States are shown to have a revealed comparative advantage in fresh orange production, while Chile, China, and Mexico do not. For lemons, Argentina, Mexico, South Africa, and Spain are shown to have a comparative advantage, while the United States, Australia, Chile, and China's negative SRCAs indicate that they do not.[48]

In this analysis, relatively small volume exporters tend to have negative SRCAs, as is the case for Chile, China, and Mexico with respect to oranges, and Australia, Chile, and China with respect to lemons/limes. It is important to note that the SRCAs presented in table 3-11 represent 2004 country exports of oranges or lemons relative to the country's exports of total fruits and vegetables, so that large export volumes of other fruits and vegetables relative to oranges or lemons will lower a country's SRCA. Chile's negative SRCAs, for example, could be explained by the fact that while it is a competitive supplier of oranges and lemons on quality and price in many markets, it exports larger volumes of other kinds of fruits and vegetables relative to oranges or lemons.

International Market Share

Another way to assess the strength across different countries' orange and lemon industries is to compare each country's international market share (share of total world exports) and

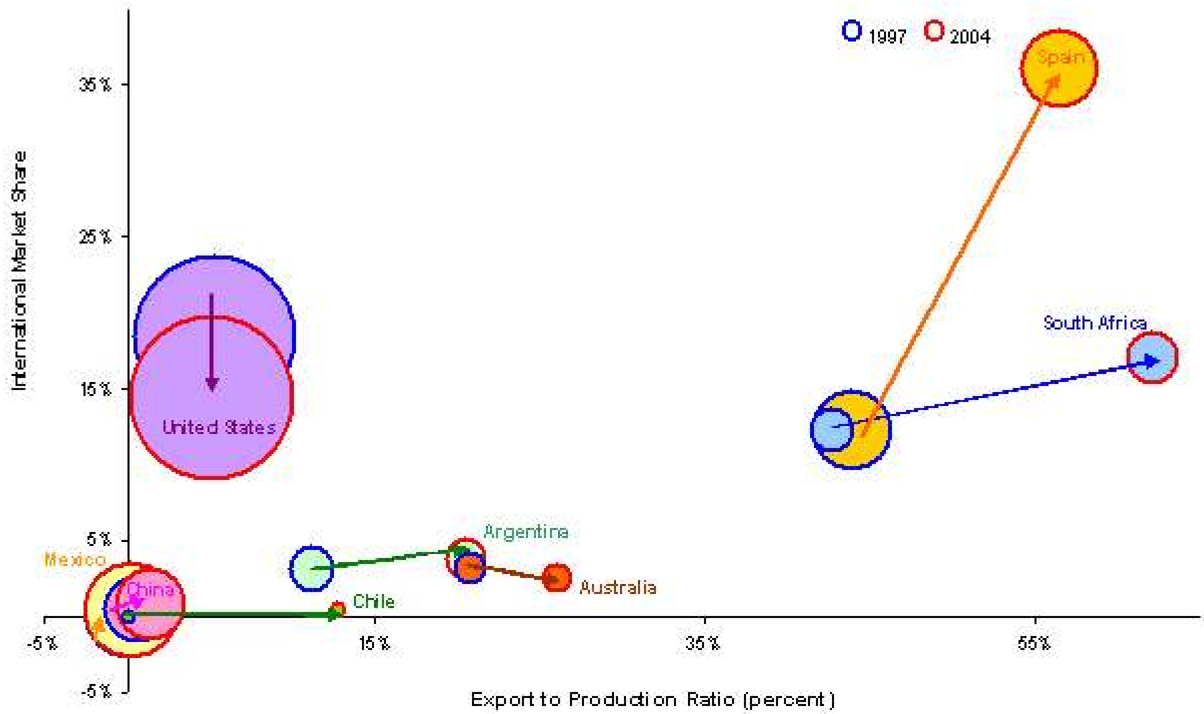
[46] The RCA is used in the international economic literature to compare the relative advantage of sectors within one country as well as the same sector among countries. For the theoretical underpinnings and citations of symmetric revealed comparative advantage, see app. C.

[47] The conversion equation is presented in app. C.

[48] Since trade data for lemons and limes cannot be disaggregated, Mexico's SRCA for lemons actually indicates a comparative advantage in the production of limes.

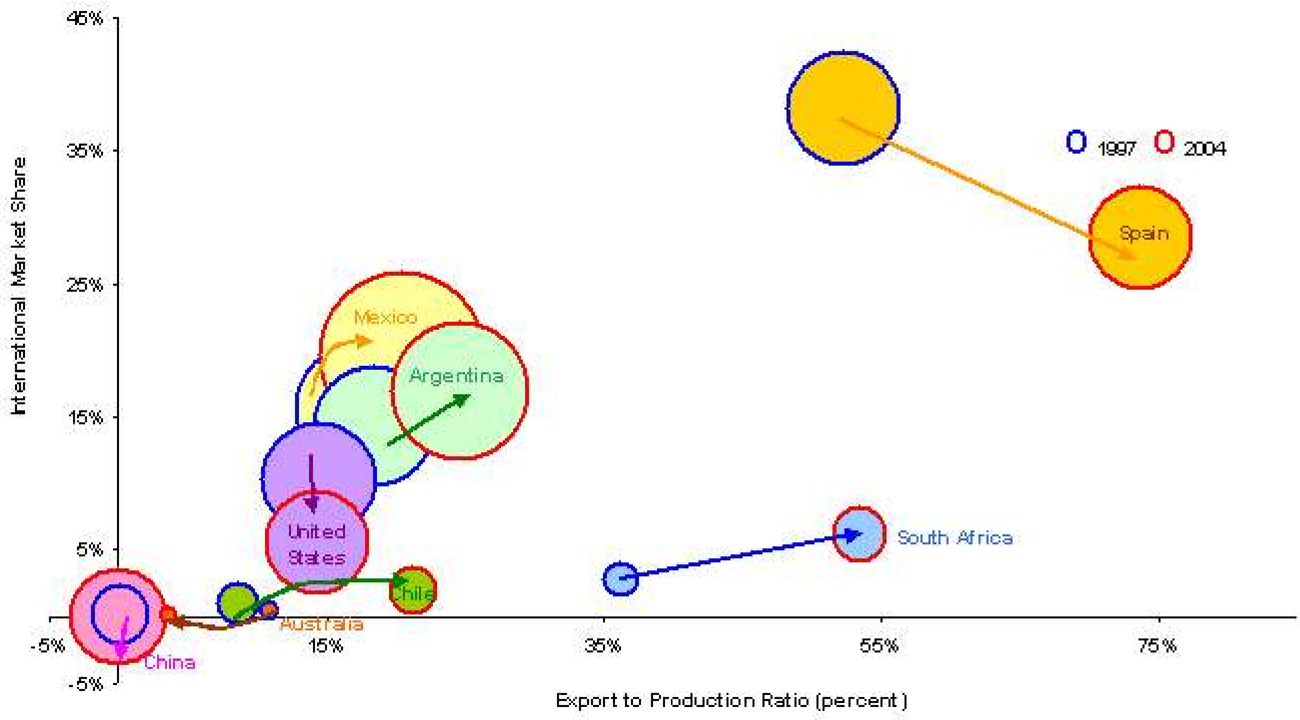
its export orientation (exports-to-production ratio). Figures 3-2 and 3-3 show changes in international market share and export orientation of major competitor countries from 1997 to 2004 for fresh oranges and lemons, respectively. The area of the circles represents the relative volume of production for each country. Changes in a country's international market and export shares from 1997 to 2004 are indicated by arrows. Competitor countries on the right side of the figures, Spain and South Africa, for example, are export oriented producers for both oranges and lemons, as indicated by relatively higher export-to-production ratios. Producers such as the United States and China (for both oranges and lemons), and Mexico (for oranges) on the left side of the figures, mainly supply the domestic market. The repositioning of a country's circle toward the upper right quadrant of the figures (see Spain, South Africa, Chile, and Argentina) indicates an improvement in export performance during the period.

Figure 3-2 International competitiveness in fresh oranges, the United States and major competitor countries



Source: Compiled by Commission staff.

Figure 3-3 International competitiveness in fresh lemons/limes, the United States and major competitor countries



Source: Compiled by Commission staff.

For oranges (figure 3-2), despite the larger size of the U.S. orange industry, smaller overall orange producers like Spain and South Africa remain important global exporters. Small volume exporters Chile, Argentina, and Australia have made significant leaps in the percentage of production destined for export while maintaining static overall production.

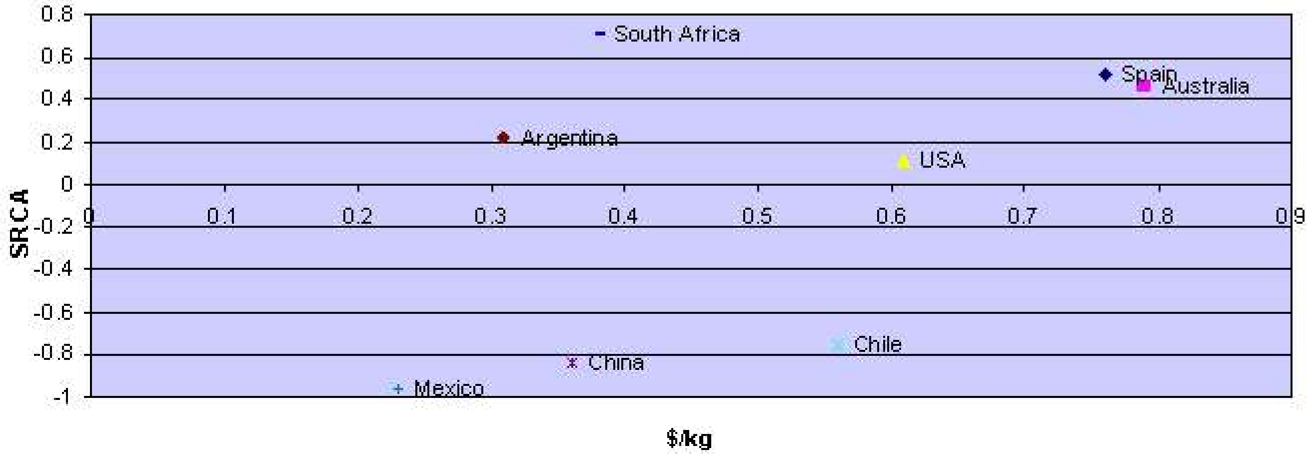
In the case of lemons (figure 3-3), although Spain's international market share fell during 1997-2004, Spain and Argentina continue to dominate world trade.[49] Despite small volume and small international market share, South Africa and Chile have made strides in boosting revenues by channeling more production into the export market. U.S. production and exports remained relatively static during the period. Australia and China, not large international suppliers, shipped a greater share of their production to their domestic markets in 2004 than in 1997.

Comparative Advantage and Price

As previously noted, the relationship between export performance and price may be illuminated using average unit values of exports. Figures 3-4 and 3-5 display export AUVs plotted against SRCA measures for oranges and lemons, respectively. The data reveal

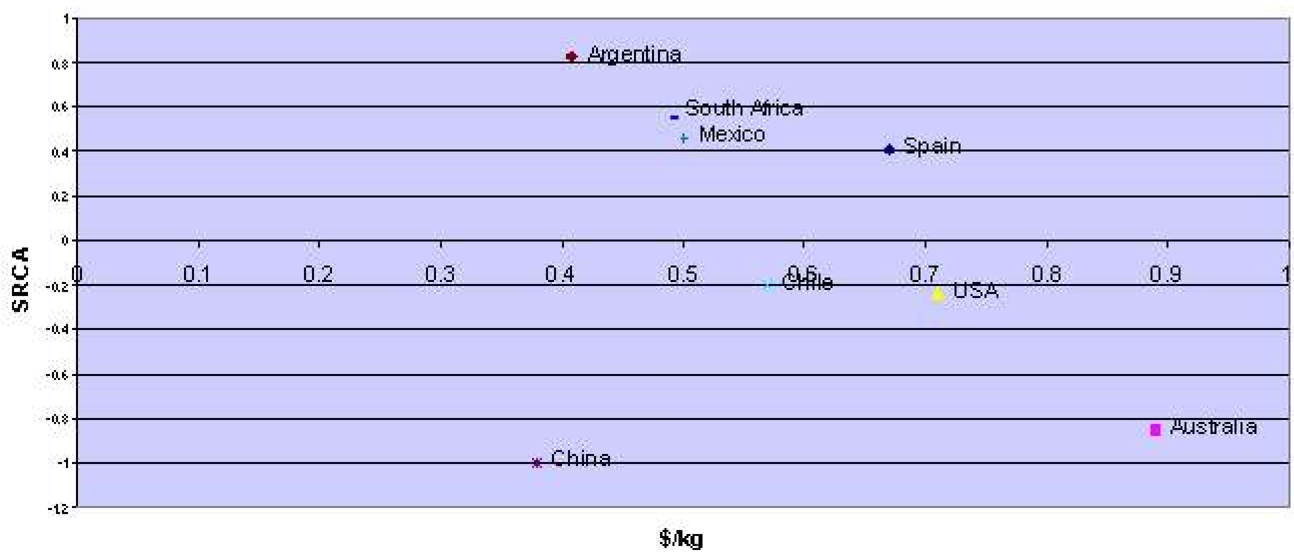
[49] Since the majority of Mexico's lemon/lime trade is believed to be limes, the figure overstates Mexico's lemon production and trade.

Figure 3-4 Fresh oranges: Average unit values of exports (FOB) and SRCA for selected suppliers, 2004



Source: Global Trade Atlas and SRCA computed by Commission staff.

Figure 3-5 Fresh lemons/limes: Average unit values of exports (FOB) and SRCA for selected suppliers, 2004



Source: Global Trade Atlas and SRCA computed by Commission staff.

contrasting information regarding oranges and lemons and confirm other analysis indicating that low AUVs do not necessarily correspond to national comparative advantage in orange exports. Although China and Mexico have low AUVs for fresh oranges, their SRCAs indicate a low comparative advantage in oranges. Conversely, Spain and Australia have relatively high AUVs, yet have the highest SRCA. This information further indicates that, for fresh-market oranges, factors such as product quality and variety, and demand in export markets are important determinants of export performance.

In contrast, the traditional relationship between price and comparative advantage is more apparent for lemons likely because lemons are more of a commodity product. The industries with a comparative advantage in lemons, as measured by high SRCA values (Argentina and

South Africa) also have the lowest AUVs.[50] The United States and Australia have the highest AUVs and display no comparative advantage in lemons.

[50] FOB data for China may be distorted owing to the relatively low volume of exports and annual variation. Chinese FOB prices for lemons are much higher in 2005. FOB unit values for Mexico mostly apply to limes. Mexican exports of lemons are small.

CHAPTER 4
United States

Introduction

The United States is a major producer, importer, and exporter of fresh oranges and lemons. The majority of oranges and lemons for the fresh market are grown in California, while the U.S. production of oranges for processing is centered in Florida.[1] U.S. fresh market orange and lemon production is large-scale and efficient by world standards, using the latest technology, research, and development. Both domestic sales and international trade are important components of the U.S. citrus industry's revenues. However, despite strong brand recognition and high-quality fresh oranges-particularly navels-and lemons, the U.S. industry faces increased competition both domestically and in key foreign markets.

Although U.S. growers have historically enjoyed a dominant position among world orange and lemon growers, a number of other citrus-growing countries are now able to compete on both quality and cost of production. In addition, U.S. production costs have been rising due, in part, to competition in the U.S. agriculture sector for key inputs, such as land, water, and chemical products. Rising costs are also attributable to increasingly stringent labor and environmental protection regulations, restrictions on land and water use, energy costs, and domestic and international food safety standards. The high cost of labor is a key limiting factor throughout U.S. agriculture sectors.

Industry Overview

Production Trends

The United States is one of the world's largest citrus producers, with its orange and lemon production valued at roughly $2 billion per year. Oranges account for roughly 60 percent and lemons account for about 15 percent of the total value of U.S. citrus production.[2] Over the past two years, production of oranges and lemons in the United States has declined. In 2005, U.S. orange production totaled 8.1 million mt, down from more than 11.7 million mt in 2003 (table 4-1). Lemon production in the United States totaled 786,000 mt in 2005, down from 931,000 mt in 2002 (table 4-2).

The combined amount of land in production of oranges and lemons in the United States has also declined, from about 390 million hectares in 2000 to about 350 million hectares in 2005, which is attributable to declines in both bearing and nonbearing area. For oranges, losses in Florida and California were 33,600 and 9,700 bearing hectares, respectively, over this period. Losses in California resulted from producers switching to other types of citrus,

[1] In 2005, California accounted for 82 percent and Florida accounted for 15 percent of U.S. fresh market orange production by volume. By value, however, California's crop represented 89 percent of U.S. fresh market orange production and Florida's represented 9 percent. Florida Agricultural Statistics Service, *Citrus Fruits Annual Summary 2004-2005*; USDA, NASS, *California Crop Production.*

[2] Ibid. The remainder comprises grapefruit (nearly 20 percent), tangerines and hybrids.

Table 4-1 Oranges: U.S. production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	11,087	11,226	10,473	11,677	8,266	[a]8,123
Production value (1,000 US dollars)	1,682,790	1,846,199	1,564,658	1,782,157	1,498,063	([b])
Bearing hectarage (1,000 hectares)	330	322	321	308	296	296
Nonbearing hectarage (1,000 hectares)	31	30	28	27	27	27
Total hectarage (1,000 hectares)	361	352	349	335	323	323
Annual yield (mt/hectare)	34	35	33	38	28	27

Source: USDA, NASS, *Citrus Fruits Annual Summary*; CASS, *California Acreage*; Florida Agricultural Statistics Service, *Commerical Citrus Acreage*.

Note: This includes oranges for processing.

[a]Production for 2005 is from official USDA 2005 forecast.
[b]Data not available.

Table 4-2 Lemons: U.S. production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	903	727	931	724	738	[a]786
Production value (1,000 US dollars)	237,362	327,964	291,425	269,753	351,897	([b])
Bearing hectarage (1,000 hectares)	26	26	25	24	24	24
Nonbearing hectarage (1,000 hectares)	4	4	2	2	3	3
Total hectarage (1,000 hectares)	30	30	27	26	27	27
Annual yield (mt/hectare)	35	28	37	30	31	33

Source: USDA, NASS, *Citrus Fruits Annual Summary*. Includes data for all lemons, including those for processing, in Arizona and California.

[a]Production for 2005 is from official USDA 2005 forecast.
[b]Data not available.

such as tangerines, clementines, and other specialty citrus varieties for the fresh market; in Florida, reductions were due to the spread of canker disease following a number of hurricanes in 2004 and Hurricane Wilma in October 2005.[3] Losses in lemon hectares are mostly due to increased competition from imports.[4] Average annual yields for all oranges and lemons produced in the United States during 2000-2005 ranged from 27-38 mt/ha.

Most U.S. orange production is geared toward the juicing and processing sectors, which account for about 75 percent of overall U.S. orange utilization. In 2005, about 1.9 million mt of total U.S. orange production were sold in the fresh market.[5] Production of oranges for the fresh market consists mainly of navel and Valencia oranges. Navels account for about 60 percent of all U.S. fresh orange production, with production ranging from about 960,000 mt to 1.3 million mt annually.[6] Bearing acreage for California navels has remained relatively steady, falling slightly between 1998 and 2004 from 51,900 hectares to about

[3] In 2004, hurricane winds spread the disease into Florida's northern regions, which was further exacerbated in 2005. The state's Canker Eradication Program requires the removal of all citrus trees in a 1,900 foot radius of an infected tree, resulting in a substantial reduction in Florida's citrus-bearing orchards. See: Murray, "World Orange Juice Availability."

[4] Interview with U.S. citrus growers/packers, September 26, 2005, Yuma, Arizona.

[5] USDA, NASS, *Citrus Fruits*, 4-5.

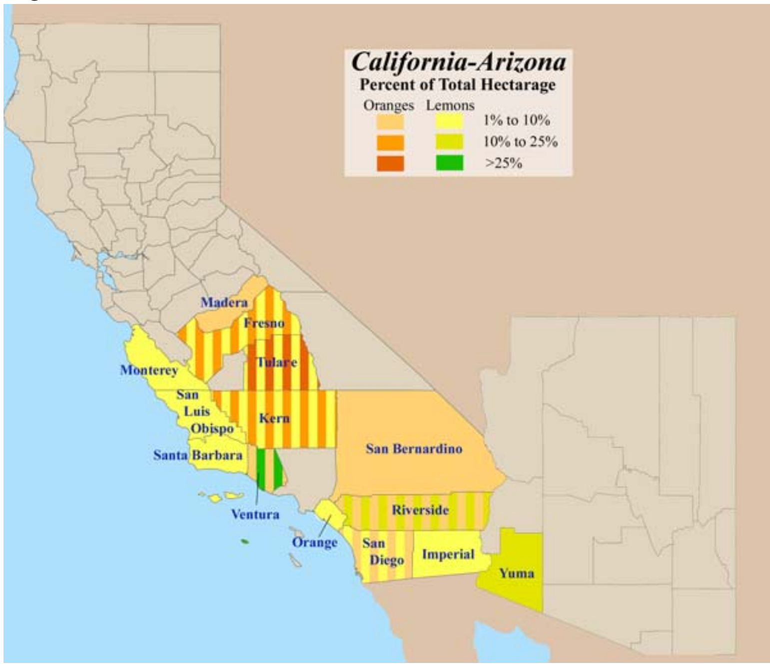
[6] Ibid. Navels are considered to be the premier fresh table orange due to their extremely sweet taste, lack of seeds, and generally thick skin which facilitates peeling.

50,800 hectares.[7] Bearing acreage for California Valencias steadily declined by about 30 percent over the same period, to about 21,000 hectares in 2004.[8] The decrease in popularity of Valencias relative to navel oranges has influenced this trend.

Growing Regions

U.S. orange and lemon production for the fresh market takes place in California, Arizona, Florida, and Texas, with the majority of fresh production in California (figure 4-1). Although Florida produces three to four times as many oranges as California (table 4-3), most are processed into orange juice, while the majority of California's oranges are sold in the fresh market.[9] The production of fresh oranges in Florida principally supplies northeast U.S. markets.[10] All U.S. lemon production is in California and Arizona, with California accounting for more than 80 percent in 2005 (table 4-4).[11]

Figure 4-1 California-Arizona: Orange and lemon growing regions



[7] CASS, *California Citrus Acreage Reports.* 1 hectare = 2.47 acres.
[8] Ibid.
[9] More than 95 percent of Florida oranges are processed into juice, compared with 15-20 percent of California's crop. (See: USDA, NASS, *Citrus Fruits.*)
[10] Florida Department of Citrus, *Florida Fresh Citrus Shipments*, 12.
[11] Large-scale commercial lemon production has not existed in Florida since the 1800s (USDA, ERS, *Fruit and Tree Nuts,* 16) because lemons do not cure or store well because of Florida's relatively humid climate (Morton, *Fruits of Warm Climates*).

Table 4-3 Oranges: U.S. production by state, 2000-2005 (1,000 metric tons)

State	2000	2001	2002	2003	2004	2005
Total (fresh and for processing):						
Florida	9,116	9,389	8,287	9,879	6,107	6,246
California	1,854	1,752	2,109	1,718	2,075	1,803
Arizona	31	18	16	16	15	15
Texas	86	67	61	64	68	59
Total	11,087	11,226	10,472	11,677	8,266	8,123
Fresh:[a]						
Florida	383	396	383	396	404	301
California	1,487	1,565	1,505	1,694	1,514	1,647
Arizona	27	23	16	14	13	11
Texas	49	49	54	43	45	47
Total	1,946	2,033	1,958	2,147	1,976	2,006

Source: USDA, NASS, *Citrus Fruits Annual Summary*; Florida Agricultural Statistics Service, *Citrus Summary 2003-04*, USDA, NASS, *California Crop Production*.

[a]Data represent fresh utilization of total production.

Table 4-4 Lemons: U.S. production by state, 2000-2005 (1,000 metric tons)

State	2000	2001	2002	2003	2004	2005
California	779	631	827	620	656	655
Arizona	124	97	103	103	83	131
Total	903	727	931	724	738	[a]786

Source: USDA, NASS, *Citrus Fruits Annual Summary*, USDA, NASS, *Arizona crops*.

Note: Data includes lemons for the fresh and processing markets. Totals may not add due to rounding.

[a]Production for 2005 is from official USDA 2005 forecast.

By orange variety, California accounts for 85-90 percent of U.S. navel production, with Florida accounting for most of the remainder (table 4-5).[12] The vast majority of U.S. Valencia oranges for the fresh market are produced in California, with a far smaller volume produced in Arizona. Orange production in Arizona and Texas is primarily small-scale, accounting for under one percent of total production. In recent years, Arizona's orange production has declined.[13] Navel production in California yields 25 mt/ha, on average, compared with about 7 mt/ha in Arizona. Similarly, lemon yields in California, estimated at about 38 mt/ha, are more than twice those of Arizona. Generally more favorable conditions in California allow growers to harvest up to three times per season, making California lemons available year round.[14]

[12] USDA, NASS, *Citrus Fruits.*

[13] Interview with U.S. citrus growers/packers, September 26, 2005, Yuma, Arizona.

[14] Ibid. The high temperatures in Arizona cause navel blooms to fall off the trees and lemon trees to bloom only once per year. In contrast, California lemon trees bloom continually throughout the season.

Table 4-5 Oranges: U.S. production by variety, 2000-2005 (1,000 metric tons)

Variety	2000	2001	2002	2003	2004	2005
Navel[a]	1,198	956	1,320	1,301	1,203	1,138
Valencia	691	692	673	534	666	679
Early/Midseason and other[b]	146	310	155	141	138	132
Total	2,035	1,958	2,148	1,975	2,007	1,949

Source: USDA, NASS, *Citrus Fruits Annual Summary.*

Note: Data represent oranges grown for the fresh market in Arizona, California, Florida, and Texas.

[a]Data include some miscellaneous variety production in Arizona and California.
[b]Data include small quantities of tangerines from Texas.

Structure and Organization

Growers

There are 7,000-8,000 growers of fresh oranges and lemons in the United States.[15] The number of growers has declined in the past few decades through continued consolidation and the development of orchard lands for other uses. A large portion of U.S. fresh orange and lemon production is marketed through a cooperative marketing system, which allows the industry to control supply movement and, thus, obtain strong prices and ensure the availability of stocks. The size of U.S. navel growers' operations varies from a hectare or less to several thousands of hectares. In 2002, the size of the average orange orchard was 18 ha in California and 6 ha in Arizona, while the size of an average lemon farm was 15 ha and 30 ha in California and Arizona, respectively.[16]

Packing Operations

Packing houses receive individual growers' product and sort, grade, and pack fruit of similar quality and size into cartons or other specialized containers. Once prepared by the packing house, the fruit is sold through its marketing operation, either through an in-house sales force, an outside agency or broker, or a cooperative selling exchange. In 2005, there were 82 orange and/or lemon packing houses in California and Arizona.[17] Almost one-half of all packing houses (39 packers) market their product through Sunkist Growers, Inc., a grower-owned cooperative with approximately 6,000 grower-members. Two other organizations, the Central California Orange Growers Cooperative and DNE World Fruit Sales, perform marketing for an additional 12 percent of packing houses. The remaining 33 packers throughout California and Arizona perform their own independent marketing.[18]

[15] Approximated by Commission staff based on available information on all citrus producers, excluding those in Florida since most production in that state is for processing. There were 14,288 citrus growers in the United States in 2002, including 7,072 growers in Florida. The 2002 *Census* reports there were about 5,730 orange growers in California, 450 in Arizona, and 620 in Texas. There were about 1,650 lemon growers in California and 230 in Arizona. (See: USDA NASS, *2002 Census of Agriculture*.)
[16] USDA, NASS, *2002 Census of Agriculture.* Calculated by Commission staff from reported farm and acreage information. As shown, Arizona's lemon sector consists of fewer larger-sized operations.
[17] California Citrus Mutual, *2005 Packinghouse Directory*.
[18] Ibid.

Integration

The U.S. industry is essentially vertically integrated due to the large role played by grower-owned cooperatives[19] in marketing fresh citrus, domestically and internationally.[20] There are several grower-owned citrus cooperatives including Sunkist Growers Inc., California Citrus Mutual, and Florida Citrus Mutual. The largest fresh citrus marketing organization, Sunkist Growers Inc., accounts for more than one-half of the California and Arizona fresh citrus market and provides both domestic and international marketing services to its grower-members. Sunkist growers own all packing houses, marketing programs, and field services under the Sunkist name. Independent packing houses are private enterprises that market their own fruit and may own citrus orchards. In general, packing houses may also perform other functions for growers, such as pruning, picking, and hauling services.[21] Most fresh citrus is marketed to retail grocers, hotels and restaurants, and institutions such as schools and cafeterias.

Market Overview

Production Utilization

Approximately 25 percent of U.S. orange production is sold to the fresh market, with the remainder processed into orange juice (both concentrated and single strength forms). Among navel oranges, about three-fourths are sold fresh.[22] Lemon growers produce primarily for the fresh market and have generally used the processing sector as a residual market.[23] From 2000-2004, between 50-70 percent of lemon production was sold fresh, while the remainder was processed into lemon juice or lemon by-products such as lemon oil for furniture polish or lemon essence for food flavoring.[24] Roughly 30 percent of U.S. fresh orange production is exported, and slightly more than 10 percent of U.S. fresh lemon production is exported.[25]

Domestic Consumption

Fresh orange consumption in the United States averaged 5.5 kilograms (kg) per person in 2004. Per capita fresh lemon consumption averaged 1.4 kilograms per person.[26] However, annual quantities of lemons consumed year-to-year can vary significantly according to

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[19] In an agricultural grower-owned cooperative, a group of growers agree to collectively market their products, relinquishing some individual control over their fruit. Cooperative members may gain an improved bargaining position vis-a-vis their customers, economies of scale in handling and processing, economical sourcing and shipment options, and reduced price risk. Cooperatives are privately owned businesses that distribute returns to members based on the volume and quality of the fruit supplied to the operation. By law, agricultural cooperative ownership is limited to entities defined as farming operations. (See: Jacobs, *Cooperatives in the U.S. Citrus Industry.*)

[20] Hoy, Cook, and Sexton, "California Agriculture, Dimensions and Issues," 104.

[21] Interview with growers/packers, September 20-25, 2005, Yuma, Arizona, and growing regions in California.

[22] USDA, NASS, *Citrus Fruits.* Although most navel oranges are sold to the fresh market, about 10-20 percent of all California navels, 30-35 percent of Florida navels, and 20-35 percent of Arizona navels are processed.

[23] USDA, ERS, *Fruit and Tree Nuts,* 18.

[24] USDA, NASS, *Citrus Fruits*, 3.

[25] USDA, FAS, PSD data.

[26] USDA, ERS, *Fruit and Tree Nuts,* 21. Per capita fresh orange demand is below the peak recorded during the 1950s and 1960s when consumers relied on fresh products for the majority of their fruit consumption, and has generally declined as more oranges are consumed as juice.

available crop supplies and utilization.[27] Fresh lemon consumption in the United States has increased slightly over the last two decades while processed consumption has declined. The use of lemons as garnishes for beverages and as food condiments, coupled with an increase in dining away from home, have contributed to the growth in fresh lemons' use in the United States. Lower consumption rates of processed lemons reflects, in part, lower consumption of lemonade, given a wider variety of beverage choices.[28]

Pricing and Marketing

U.S. prices for fresh oranges and lemons generally increased in recent years.[29] During 2001-2005, domestic fresh orange prices rose from $0.50/kg to $0.59/kg and lemon prices increased from $0.78/kg to $0.99/kg (table 4-6). Prices for California-grown Valencias increased from about $0.49/kg to $0.62/kg, California navel oranges from $0.55/kg to $0.60/kg, and California lemons from $0.80/kg to $0.99/kg during the same period.[30]

Table 4-6 Oranges and lemons: U.S. average annual prices, 2001-2005 (US dollars/kg)

Item	2001	2002	2003	2004	2005
Oranges	0.50	0.54	0.48	0.55	0.59
Lemons	0.78	0.94	0.86	0.83	0.99

Source: NASS, USDA, *Agriculture Prices*.

Note: Data represent "FOB packed" prices, which indicates the value just after leaving the packing house.

Data on monthly prices for U.S. citrus fruit during 2005 indicate that lemon prices tend to peak during the low supply period between May and July, when California lemons are no longer harvested and before the Arizona lemon season begins in August (table 4-7). Orange prices tend to peak during November and December, when new crop navel oranges begin to enter the market.

Table 4-7 Oranges and lemons: U.S. monthly prices, 2005 (US dollars/kg)

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Oranges	0.56	0.55	0.55	0.58	0.59	0.56	0.51	0.49	0.54	0.55	0.67	0.57
Lemons	0.90	0.88	0.87	0.95	01.21	01.15	01.06	0.94	0.83	0.79	0.84	0.79

Source: NASS, USDA, *Agriculture Prices*.

Note: Data represent "FOB packed" prices, which indicates the value just after leaving the packing house.

Most citrus cooperatives operate as sales agents for their grower-members according to a marketing agreement. The price a member receives for his fruit is determined after the fruit is sold in a practice called pooling, which is common in fruit and vegetable cooperatives. Individual grower fruit is commingled with others of the same grade and quality and sold

[27] USDA, ERS, *Fruit and Tree Nuts*, 21.
[28] In contrast to lemonade, orange juice is more of a year-round product, e.g., consumed with breakfast.
[29] Price information reported by USDA reflect so-called "FOB Packed" prices, which reflect the packing house door price and include the costs of sorting, grading, packing, cooling, and marketing.
[30] USDA, NASS, *Agriculture Prices*.

at the same time. The average price paid for the pool's contents is then distributed based on prorata contributions to the pool.

California and Arizona oranges and lemons were previously marketed under a Federal marketing order, which was eliminated in 1993, in part because some growers claimed that the order failed to raise their incomes and created inequities among growers by placing fewer restrictions on those who sold to the export market.[31] Recently, a voluntary marketing program was established under two grower-owned and-operated marketing agencies: the California Citrus Growers Association (CGA) and the California-Arizona Lemon Growers Association (CALGA). The purpose of the program is to anticipate imbalances between supply and demand of oranges and lemons in the U.S. market and to support prices.[32] Approximately 85-90 percent of the California citrus industry is represented by these two associations.[33]

International Trade

The United States is a net-exporter of both fresh oranges and lemons. In 2005, an estimated 27 percent of U.S. fresh orange production was exported (table 4-8) and 13 percent of U.S. fresh lemon production was exported (table 4-9). Although the majority of U.S. fresh oranges and lemons are consumed domestically, international trade has become increasingly important to the U.S. citrus industry. For example, about 30 percent of Sunkist's grower production is exported, accounting for 45 percent of grower revenue.[34] Imports account for a minimal amount of domestic consumption of fresh oranges each year, generally less than 5 percent. U.S. exports of fresh lemons have posted an overall decline since 2000. Lemon imports account for a greater share of domestic consumption than orange imports, and tend to be highly variable year-to-year depending on domestic supplies and utilization for both the fresh and processing markets.

The United States has protocols for citrus which allow exports to supply important markets, such as Australia, China, Japan, and South Korea. Some of these countries grow citrus and are sensitive to pests and diseases addressed by the protocols. Other trade agreements have also had an important impact on the U.S. export market for citrus fruit. Most U.S. exports are to countries with which trade access for citrus has been negotiated, including Canada, China, Japan, South Korea, and Mexico.

Current U.S. NTR import tariffs on oranges and lemons are low compared to most countries. The estimated U.S. ad valorem equivalent (AVE) import tariff on oranges is about 2 percent and the AVE on lemons is between 4-5 percent.[35] This compares to current import tariffs of 11-13 percent in China (for fresh and processed fruit, respectively), tariffs of 20-30 percent on oranges and 15-30 percent on lemons in Taiwan, and tariffs of 30-50 percent in

[31] Zepp, "Fruit and Vegetable Marketing Orders."

[32] Interview with U.S. citrus growers/packers, September 26, 2005, Yuma, Arizona. Through these newly-formed marketing arrangements, fruit is withheld from the market when prices are low and made more available when prices are high through joint consensus with growers and handlers. The CCGA and the CALGA are organized under the laws of the State of California and compliant with the federal Capper-Volstead Act.

[33] CCGA, "Mission Statement."

[34] Wooton, "Sunkist Experience."

[35] The specific tariff on oranges is 1.9¢/kg and the tariff on lemons ranges from 1.8¢/kg to 2.1¢/kg, depending on the time of year. Calculated by Commission staff using available trade data from 1999-2001.

Table 4-8 Fresh oranges: U.S. imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005[a]

Year	Production[b]	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	2,035	46	526	1,555	3	26
2001	1,958	56	506	1,508	4	26
2002	2,148	59	474	1,733	3	22
2003	1,975	54	592	1,437	4	30
2004	2,007	66	547	1,526	4	27
2005[c]	1,949	69	534	1,484	5	27

Source: Production - USDA, NASS, *Citrus Fruits Annual Summary*; Imports/exports: Compiled from official statistics of the U.S. Department of Commerce.

[a]Imports, exports, and production volume are on a crop year basis, i.e., 2000 crop year runs from November 1999 to October 2000.
[b]Production includes U.S. oranges grown for the fresh market.
[c]Production data is from official USDA 2005 forecast.

Table 4-9 Fresh lemons: U.S. imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005[a]

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	903	27	107	823	3	12
2001	727	36	109	654	6	15
2002	931	35	95	871	4	10
2003	724	27	108	643	4	15
2004	738	39	96	681	6	13
2005[b]	786	35	100	721	5	13

Source: Production - USDA, NASS, *Citrus Fruits Annual Summary*; Imports/exports: Compiled from official statistics of the U.S. Department of Commerce.

[a]Imports, exports, and production volume are on a crop year basis, i.e., 2000 crop year runs from November 1999 to October 2000.
[b]Production data is from official USDA 2005 forecast.

Korea.[36] Calculated AVE tariffs on EU imports range from 3-32 percent for oranges and 13-52 percent for lemons, depending on the season. Japan and Canada allow fresh oranges and lemons from the United States to enter duty-free. Australia's tariffs are scheduled to be duty-free under the recent U.S.-Australia Free Trade Agreement.[37]

Exports

U.S. fresh orange exports have risen steadily in recent years, from $285 million in 2000 to $349 million in 2005 (table 4-10). Canada and Korea accounted for more than 50 percent of the value of U.S. orange exports in 2005, with China, Japan, and Hong Kong accounting for another 30 percent of such exports. The total value of U.S. lemon exports was more variable during the period, with annual values fluctuating between $66 million and

[36] WITS database. There are often inconsistencies in the reported tariffs for a certain country among different reporting sources, including WTO, the WITS database, APEC, and other organizations.
[37] USDA, FAS, "United States and Australia Free Trade Agreement."

Table 4-10 Fresh oranges: U.S. exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Canada	169,332	154,496	155,677	188,629	173,897	170,744
Korea	68,721	72,885	78,034	113,494	119,893	101,241
Japan	105,700	103,848	81,786	86,638	74,016	73,608
Hong Kong	89,386	68,672	63,088	63,530	66,166	65,422
China	16,131	23,100	22,423	37,957	29,594	33,125
Other	76,595	82,841	73,026	101,475	83,576	89,388
Total	525,865	505,842	474,034	591,723	547,142	533,528
	Value (1,000 dollars)					
Canada	78,782	85,097	87,057	94,429	104,280	106,242
Korea	38,859	41,190	51,900	68,635	73,579	82,613
Japan	62,234	58,882	48,424	49,814	45,590	52,173
Hong Kong	53,736	42,257	41,904	39,843	41,290	41,566
China	7,547	13,897	11,874	16,045	13,525	15,665
Other	43,399	50,438	38,178	47,668	51,442	50,652
Total	284,557	291,761	279,337	316,434	329,706	348,911
	Unit value (dollars per metric ton)					
Canada	465	551	559	501	600	622
Korea	565	565	665	605	614	816
Japan	589	567	592	575	616	709
Hong Kong	601	615	664	627	624	635
China	468	602	530	423	457	473
Other	567	609	523	470	616	567

Source: Compiled from official statistics of the U.S. Department of Commerce.

$79 million (table 4-11). Exports to Japan account for roughly one-half of all U.S. lemon exports by value; Japan sources an estimated 70-80 percent of its lemons from the United States.[38] Canada was the other leading export destination for U.S. lemons during 2005. Lemons destined for Asian markets tend to be larger in size than those consumed in the United States and are often purchased as gifts or decorations. Available information indicates that prices for relatively large, high-quality U.S. oranges and lemons tend to be higher in most foreign markets as compared with prices in the United States, making exports an important component of the U.S. industry's annual sales.[39]

Imports

U.S. imports of oranges have risen steadily in recent years, from $41 million in 2000 to $68 million in 2005 (table 4-12). Imports were sourced primarily from South Africa and Australia, which together accounted for nearly 90 percent of total U.S. orange imports in 2005. These imports were primarily navels. In terms of volume, imports from South Africa have grown three-fold since 2000, making South Africa the principal import supplier to the United States. Mexico accounted for 16 percent of total imports in 2005;[40] however, Mexico is at a disadvantage relative to Australia and South Africa in that its growing season tracks that of California navels, whereas production of Australian and South African navels is

[38] Sunkist Growers, "Keeping Growers Informed." Japan imports another 14-17 percent of its lemons from Chile, and 1-3 percent from South Africa.

[39] Interview with U.S. citrus growers/packers, September 28, 2005, Ventura, California.

[40] Information from Mexican citrus industry officials indicates that many of the oranges exported to the United States from Mexico are juice oranges that are shipped from growing areas in Mexico to juice processing plants along the U.S. side of the border. Recently, APHIS promulgated a new rule that expedites these oranges more easily and quickly through U.S. quarantine procedures, 7 CFR Part 319, June 8, 2006.

Table 4-11 Fresh lemons: U.S. exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Japan	69,801	68,835	58,221	62,118	52,093	53,093
Canada	23,401	22,900	22,653	29,436	28,857	30,179
Hong Kong	7,882	9,639	6,171	6,567	6,107	6,501
Australia	1,318	1,475	1,528	2,693	2,343	3,092
Korea	2,868	3,810	3,362	4,084	3,537	3,573
Other	2,072	2,593	3,307	3,094	2,644	3,359
Total	107,342	109,252	95,242	107,992	95,581	99,797
	Value (1,000 dollars)					
Japan	47,589	45,265	46,935	46,873	33,997	34,973
Canada	15,493	14,939	14,756	17,953	19,712	24,132
Hong Kong	4,580	5,380	4,291	4,642	4,653	6,158
Australia	776	1,090	1,946	3,382	3,049	4,404
Korea	1,787	2,281	3,394	3,044	2,909	3,367
Other	1,630	1,820	2,594	2,634	2,424	2,814
Total	71,855	70,775	73,916	78,528	66,744	75,848
	Unit value (dollars per metric ton)					
Japan	682	658	806	755	653	659
Canada	662	652	651	610	683	800
Hong Kong	581	558	695	707	762	947
Australia	589	739	1,274	1,256	1,301	1,424
Korea	623	599	1,010	745	822	942
Other	787	702	784	851	917	838

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 4-12 Fresh oranges: U.S. imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
South Africa	9,414	17,419	16,219	23,126	26,766	28,193
Australia	24,081	16,133	20,813	19,737	22,685	27,446
Mexico	7,793	15,245	16,466	6,498	11,103	10,685
Italy	221	538	240	272	155	1,225
Dominican Republic	1,438	1,158	1,478	1,619	1,374	1,168
Other	3,517	5,140	3,501	3,139	3,585	313
Total	46,464	55,633	58,717	54,391	65,668	69,030
	Value (1,000 dollars)					
South Africa	6,358	14,744	15,436	23,993	26,563	32,100
Australia	28,611	18,404	23,004	22,037	25,136	28,725
Mexico	3,085	4,786	6,413	2,473	5,346	4,947
Italy	154	427	184	217	180	1,745
Dominican Republic	528	484	681	680	704	710
Other	2,337	870	659	476	857	225
Total	41,073	39,715	46,377	49,876	58,786	68,452
	Unit value (dollars per metric ton)					
South Africa	675	846	952	1,037	992	1,139
Australia	1,188	1,141	1,105	1,117	1,108	1,047
Mexico	396	314	389	381	481	463
Italy	697	794	767	798	1,161	1,424
Dominican Republic	367	418	461	420	512	608
Other	664	169	188	152	239	719

Source: Compiled from official statistics of the U.S. Department of Commerce.

counterseasonal to that of the United States. U.S. imports of lemons marginally increased during 2000-2005, but varied noticeably from year-to-year (table 4-13). Chile and Mexico were the main suppliers of imports during the period, with Chile accounting for about two-thirds and Mexico accounting for more than 36 percent of U.S. lemon imports each year.

Table 4-13 Fresh lemons: U.S. imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Chile	6,892	6,796	10,719	14,136	19,324	20,271
Mexico	529	601	1,007	2,746	12,704	12,502
Spain	8,937	7,596	21,124	4,017	3,749	926
South Africa	47	0	385	1,534	448	347
Dominican Republic	227	183	271	272	449	282
Other	10,163	20,678	1,230	4,499	2,358	299
Total	26,795	35,854	34,736	27,204	39,032	34,627
	Value (1,000 dollars)					
Chile	4,163	3,490	4,977	8,824	11,115	10,752
Mexico	109	78	291	567	3,651	3,971
Spain	4,656	4,480	11,555	2,147	2,786	714
South Africa	22	0	280	1,341	436	246
Dominican Republic	199	148	167	155	321	221
Other	6,691	12,330	431	665	931	395
Total	15,840	20,526	17,701	13,699	19,240	16,299
	Unit value (dollars per metric ton)					
Chile	604	514	464	624	575	530
Mexico	206	130	289	206	287	318
Spain	521	590	547	534	743	771
South Africa	468	([a])	727	874	973	709
Dominican Republic	877	809	616	570	715	784
Other	658	596	350	570	395	1,321

Source: Compiled from official statistics of the U.S. Department of Commerce.

[a]Data not available.

This marks a change from 2000-2001 when Argentina supplied most U.S. lemon imports. Argentina was later prohibited from shipping to the United States because of concerns about citrus canker.[41]

Competitive Factors

Natural Endowments

The climatic conditions of California's Central Valley are ideal for the production of sweet oranges. The relatively cool, dry climate of California produces oranges that have brightly colored, thick peel and flesh, and California's loam soils are noted for contributing to the fruit's flavor and fragrance.[42] Soil and climate conditions in Arizona and Texas are generally considered less suitable for producing oranges, given their particular soil qualities and

[41] For further information, see "Pest and Diseases" in this chapter and in chapter 7 of this report.
[42] Morton, *Fruits of Warm Climates*, 134-142.

relatively high temperatures. In contrast, lemon production is particularly suited to the generally dry, arid climate of the southern desert areas of both California and Arizona.

Water Issues

Intense demand for water supplies, primarily reflecting increased urban growth and development in both California and Arizona, is placing pressure on agriculture. In addition, water availability and supplies throughout the southwest are governed by a myriad of laws and policies related to the region's water resource management system.[43] Over the large growing area in California, rainfall varies greatly and groves must be irrigated from April through October. Because of the high cost of water, many citrus growers in Tulare and Kern counties have switched to more efficient irrigation systems, such as low-volume irrigation. In Arizona, water costs are generally lower and larger supplies are available despite the increased competition for water resulting from development. Generally, growers in the desert areas of Arizona and parts of California have lower water costs, ranging from $125-$150/ha in Arizona and about $200/ha in the southern areas of California.[44] However, water costs in California are highly variable, and range between $800-$2,000/ha in California's Central Valley and Coastal areas.[45] To conserve water, growers in California mostly irrigate their orchards using micro-sprinkler systems. Flood irrigation is more widely practiced in Arizona.

Pests and Diseases

The presence of certain pests and diseases has the potential to reduce the marketability of fruit,[46] restrict industry exports to foreign markets, and reduce productive bearing acreage in growing regions over time. The main pests and disease conditions currently affecting California and Arizona orange and lemon production are foot rot, wood rot, psorosis, citrus nematode, thrips, septoria, and penicillium decay.[47] Canker, greening, and tristeza are the largest threats to Florida's citrus sectors.[48] The Mediterranean fruit fly (medfly) has also been found in California and Florida.[49] Typically, U.S. growers prevent and control pest damage using multiple applications of broad-spectrum pesticides. Less typical is integrated pest management, which involves the use of selective pesticides and beneficial predators to control pest damage.[50]

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[43] Schiller and Fowler, "Ending California's Water Crisis."

[44] Interview with growers/packers, September 20-25, 2005, Yuma, Arizona, and growing regions in California.

[45] Interview with U.S. citrus growers/packers, September 28, 2005, Ventura, California; University of California, *Sample Costs to Establish an Orange Orchard*.

[46] Fresh market producers are more concerned with the cosmetics of the fruit than producers whose main outlet is for juice production and therefore must properly manage pests that affect merely the appearance of the fruit.

[47] University of Arizona, *Diseases of Citrus in Arizona;* University of California, "Citrus Thrips;" University of California, "Citrus Septoria Spot."

[48] University of Florida, *2006 Florida Citrus Pest Management Guide*.

[49] CDFA, "Preventing Biological Pollution;" University of Arizona, "Medfly Situation Declared Over;" University of Florida, "Featured Creatures, Mediterranean Fruit Fly."

[50] This program involves careful monitoring of pests and particularly precise timing and application of pesticides. Growers hire licensed pest control advisors who monitor a grower's fields for pest and nutrition problems and suggest remedies.

Seasonality

Most fresh orange producers plant multiple varieties of fruit with staggered maturity dates to maintain year-round production and market supplies. The characteristics of different varieties as well as regional climate and altitude determine the fruit's marketing season. Overall, early season sweet oranges mature in September or October; mid-season oranges mature in late November to early January; and late season oranges mature in February or March. Lemon production seasons are less variable. The marketing seasons for U.S. oranges and lemons are shown in the following tabulation:

Oranges and lemons: U.S. marketing seasons by variety and region

Item and variety	Marketing season
Oranges:	
Arizona oranges (all varieties)	November 1 - August 31
California navel	November 1 - June 15
California Valencia	March 15 - December 20
Florida early and mid-season	October 1 - April 15
Florida Valencia	February 1 - July 31
Florida navel	September 15 - January 31
Texas oranges (all varieties)	September 25 - May 15
Lemons:	
Arizona lemons	August 15 - March 1
California lemons	August 1 - July 31

Source: USDA, NASS, *Citrus Fruits Annual Summary.*

U.S. navel oranges are generally available in early fall (Florida) to late fall (California). California's season extends through June, while Florida navel supplies in east coast markets are generally exhausted by spring. The timing of Valencia orange production complements that of the navel with availability mainly in the spring, summer, and early fall.[51] Most U.S. imports of navel oranges are shipped during spring and summer, before the new domestic crop is available. Some growers have had success extending the season for Washington navels by allowing the fruit to remain on the tree for a longer period.[52]

The U.S. lemon harvest begins in August in Arizona and the California desert, and in September in the California Central Valley and coast. California lemon growers enjoy a year-round season, made possible by continual tree bloom and cold-storage. With only one bloom per season in Arizona, lemons from that state are not available beyond March each year. Arizona growers have typically supplied the market in late August and early September, before new crop California lemons have reached optimal market sizes.[53] Lemon imports peak in the summer as the season is ending in the California coast, but before it has begun in Arizona and the California desert.

[51] The reduced quality of the California Valencia due to disease and poor weather conditions, along with increased supplies of navels from Southern Hemisphere producers in the summer months, has reduced the Valencia's importance to California fresh market growers.

[52] Interview with U.S. citrus grower/packers, September 29, 2005, Visalia, California.

[53] Interview with U.S. citrus growers/packers, September 26, 2005, Visalia, California.

Labor

Rising labor costs remain a concern in the U.S. agriculture sectors, driven in part by a growing perception of an increasing shortage of farm workers in the United States.[54] According to an industry trade group, there was a shortage of 70,000-80,000 workers affecting all crop production in the California Central Valley in 2005.[55] In many key growing areas, the citrus sector competes for labor with other agriculture sectors, as well as non-agriculture sectors. This competition may be bidding up wage rates.[56] Industry representatives indicate that labor costs vary among states, and even among localities within a state, depending on minimum wage rates, workers' compensation insurance, and other variables.[57] California has one of the highest agriculture labor costs in the nation, with wage rates averaging $8.30/hour for hired field workers and $6.70/hour for crop workers in 2003.[58] Most other states follow the Federally-mandated minimum wage requirements ($5.15/hour).[59] In California, workers' compensation premiums and unemployment insurance are 10-20 percent and 5 percent of wages, respectively.[60] Mandatory insurance premiums and taxes add a reported 23-33 percent of the cost of employing a farm worker.[61]

In addition, labor issues in the United States, especially in the southwestern and southeastern states, are invariably influenced by laws and policies governing migrant and seasonal worker programs, worker assistance programs, and immigration.[62] According to official reports, an estimated 40-55 percent of the nation's agricultural workers in the United States are not legally authorized to work in the country.[63]

Land

Competition for land for both agricultural and non-agricultural uses is driving up land prices and limiting the farmer's ability to expand production and plant new trees. In particular, increased urbanization and suburban encroachment on traditional farmland has raised the opportunity cost of maintaining farm production in states with rapidly-growing populations-such as California, Arizona, and Florida. This has resulted in the loss of traditional farmland to nonagricultural uses.[64] For example, in 2005, land near the city of Clovis in Fresno County, California, was worth approximately $37,000/ha for agriculture, but up to $741,000/ha for development.[65] While land values for row crops range from

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[54] WGA, "Western Growers Warns of Labor Shortage Crisis;" CFBF, "Farm Labor Shortage Approaches Critical Level;" and interview with U.S. citrus growers/packers, September 29, Visalia, California. A 1997 GAO study concluded that although widespread farm labor shortages are unlikely, localized shortages of farm labor may exist for individual crops and in specific production areas.

[55] WGA, "Western Growers Warns of Labor Shortage Crisis."

[56] Interview with U.S. citrus growers/packers, September 26, 2005, Yuma, Arizona.

[57] Interview with U.S. citrus growers/packers, September 29, 2005, Visalia, California. The packing house generally pays workers' compensation insurance, which may be passed through to the grower through higher packing house charges.

[58] CRS, "Farm Labor Shortages," 15-16. Field workers include those that plant, cultivate and harvest crops; crop workers include field packers, supervisors, and other direct hires and contract labor.

[59] Hurley, *A Cross Comparison between California and its Domestic and International Competitors*, 15.

[60] Martin, "Labor Relations in California Agriculture," 7.

[61] Ibid. Based on a worker with a $6/hr wage rate.

[62] Martin, "Labor Relations in California Agriculture."

[63] GAO, *H-2A Agricultural Guestworker Program*, 31; CRS, "Farm Labor Shortages," 1.

[64] Interview with growers/packers, September 29, 2005, Visalia, California; Sokolov, "California's Edge Problem;" CFBF, *Central Valley Land Use Report.*

[65] Barbassa, "Farmers Giving Up on Farmland Protection."

$3,200-$13,600/ha in the San Joaquin Valley of California, citrus orchard values range from $12,000-$25,000/ha.[66] California has maintained policies to encourage the preservation of its agricultural lands, such as the Land Conservation Act of 1965 (also known as the Williamson Act).[67] However, recent developments indicate that the shift of land out of agriculture in important California citrus counties will continue. Two-thirds of the San Joaquin Valley's farm acreage (about 12,600 hectares) began the process of opting out of the Williamson Act starting in 2003. In Arizona, the decline in citrus acreage is reportedly mainly the result of real estate development, particularly in the central region of the state, near Phoenix, where very little citrus acreage remains.[68]

Yields

Annual average orange and lemon yields in the United States are high compared with other producing countries, due to multiple harvests per year and productive tree and land management. U.S. average annual yields for oranges and lemons ranged from 27-38 mt/hectare during 2000-2005 (tables 4-1 and 4-2), including small and large scale production with varying degrees of efficiency. However, yields in California are much higher than those in Arizona.[69] Faced with increasing competition and price pressure in the U.S. market and abroad, some U.S. industry representatives believe that increasing yields through higher tree densities and increased plantings of more productive younger trees could raise U.S. global competitiveness. Large-scale, efficient citrus production typically involves tree densities of 250-300 trees per hectare which can yield between 45-65 mt/hectare.[70] Some U.S. lemon producers believe that, to remain competitive, the U.S. industry needs to plant about 420 trees per hectare, which would yield between 80-100 mt/hectare.[71] In addition, since younger trees tend to grow larger, more desirable fruit, replacing older trees with younger with more frequency may be necessary. However, there has been a drop in the rate of new lemon tree plantings in California since 2001, and there were no new plantings of lemon trees in most parts of Arizona in 2005.[72]

Production Technology

Citrus growers in the United States intensively manage their orchards to improve yields and fruit quality using a variety of cultural and management practices, techniques, and materials. Operations are generally automated with the use of tractors, mechanical hedging machines, and automatic irrigation systems and equipment. Pruning, fertilization, irrigation, frost

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[66] University of California, *Sample Costs to Establish an Orange Orchard*, 11.

[67] California Department of Conservation, *Williamson Act Fact Sheet;* CFBF, *Central Valley Land Use Report*. The California Land Conservation Act of 1965, which currently applies to most California counties, provides for as much as a 75-percent reduction in property taxes for land committed to agriculture for a 10-year period. This law requires a 10-year waiting period between a request to withdrawal property from agriculture and the initiation of development. Of California's 28.1 million acres of farmland, 16.6 million are currently protected by the law. (See: Barbassa, "Farmers Giving Up on Farmland Protection.")

[68] Interview with U.S. citrus growers/packers, September 26, 2005, Yuma, Arizona.

[69] Despite its relatively low yields, the Arizona lemon industry has traditionally taken advantage of the window of opportunity to supply lemons in late August and early September just before the southern California crop is available.

[70] Interview with growers/packers, September 29, 2005, Visalia, California. Converted by Commission staff based on U.S. citrus industry representatives, estimates of tree densities of 100-125 trees per acre and per-acre yields of 700-1000 field boxes per acre.

[71] Ibid. Converted by Commission staff based on U.S. citrus industry representatives, estimates of tree density of 170 trees per acre and per-acre yields of 1,200-1,600 field boxes per acre.

[72] Interview with U.S. citrus growers/packers, September 26, 2005, Yuma, Arizona.

protection, and pest management are highly coordinated. Whenever possible, U.S. growers use mechanization to decrease labor costs. Tree pruning is most effectively done by hand, tree hedging is most often done mechanically, and pruning is facilitated by a custom shredder.[73] Freeze-aversion production practices are used for both orange and lemon production.[74] Frost protection is accomplished through the use of wind machines, rootstock/varietal selection (bred for cold-hardiness), denser tree plantings, and the use or non-use of irrigation.[75] Since orchard sizes are typically large, all-terrain vehicles are used for monitoring orchards, checking the irrigation system, and weeding. Tractors are used for transporting 900-pound field bins of fruit to trucks for transport to the packing house. Cold storage is generally available at operations throughout California, but is not widely used by growers in Arizona. Oftentimes, fruit is left on the tree to spread the supply throughout the season and thereby stabilize prices; in such cases, growth regulators are applied to the trees in mid- to late season to maintain the more-desirable thin rind on not-yet-harvested fruit and to minimize premature fruit drop. Fruit is generally hand-picked by a contracted harvesting company.[76] Timing of the harvest of individual orchards is typically coordinated by the packing house, so that packing operations can be precisely scheduled to maximize efficiency.

Government Policies and Support

The U.S. citrus industry is not directly supported by financial outlays under Federal or state government programs. In some cases, citrus growers may receive direct payments under emergency funding provided in response to catastrophic disease outbreaks or weather damage.[77] Other limited funding is available through various broad-based programs, such as USDA's Market Access Program (MAP), which assists U.S. producers, exporters, and other trade organizations in financing promotional activities for U.S. agricultural exports. However, to date, the U.S. citrus industry has not benefitted greatly from this program.[78] Growers may also benefit indirectly from other government programs, including general agricultural funds and programs funded through producer assessments. Such funding is primarily financed through industry self-assessments, thus representing an initial cost to producers. For example, the Citrus Research Board, a grower-directed industry research organization in California, had a $2 million budget in 2005 and is funded by a mandatory grower fee of 2.8¢ per 55-pound field box on all California-grown citrus.[79] The Central California Tristeza Eradication Agency also charges growers in certain pest control districts

[73] Ibid. Interview with U.S. citrus industry representative, September 29, 2005, Davis, California.

[74] Oranges are moderately frost sensitive while lemon trees are highly frost sensitive. In the San Joaquin Valley of California, up to 33 nights per year are subject to frost. In 1990 and 1998, extreme freezes severely curtailed citrus production in that area.

[75] Orchard floors are kept free of vegetation allowing the soil to absorb solar radiation during the day which it releases at night raising the air temperature. Water applied to the orchard floor also releases heat as the air temperature falls.

[76] An orchard is typically picked in thirds, resulting in three harvests over the growing season.

[77] Florida's commercial citrus growers are being compensated for Florida's citrus canker eradication program which was established in response to a disease outbreak aggravated by a series of hurricanes. (See: Salisbury, "Feds of Pay Citrus Growers $100 million more for Lost Trees.")

[78] USDA, FAS, "Horticultural Success Stories." The MAP (formerly called the Market Promotion Program) uses funds from USDA Commodity Credit Corporation. Financed activities include consumer promotions, market research, technical assistance, and trade servicing.

[79] University of California, *Sample Costs to Establish an Orange Orchard*, 8.

in the Central Valley an assessment to maintain an eradication program for the control of the disease. The cost to growers was approximately $10 per acre in 2005.[80]

Business Climate and Investment

Entry into citrus growing has become increasingly difficult, mostly because of high and rising land values.[81] Most orchards have been owned by the same family for several generations. Entry into other aspects of the industry, such as packing and distribution, is also difficult because of the dominance of grower cooperatives. Many of the packing houses are also family-owned businesses that have multi-generational roots, often in families that also own orchards. New business investment, including foreign-owned investment, has been mainly focused in citrus processing and orange juice processing plants in Florida, with relatively lower rates of investment in the fresh citrus market and in the southwest. New business entry is also hampered by perceived low returns in the U.S. fresh citrus industry given rising costs and stable or decreasing prices.[82] Pricing pressures in the industry are reportedly the result of both increased supplies from foreign competitors and increased dominance of large retail chains, such as Wal Mart, that have substantial pricing power.[83]

Regulatory Compliance

Agricultural production in the United States is becoming increasingly regulated. At both the farm and packing house level there is increased attention on a range of regulatory and voluntary market requirements related to food safety standards, worker protections, compensation insurance, and environmental protection. These requirements have the effect of raising administrative requirements and overall production costs to ensure compliance. In the area of food safety, additional and ongoing record-keeping and periodic outside audits are needed to ensure compliance with both government and market standards.[84] Higher costs are also attributable to increased worker protections and services, such as health insurance, housing, education and training services, and sanitation. The cost of workers' compensation insurance in California increased significantly during the 2000-2003 period and remains relatively high.[85] Environmental regulations and voluntary guidelines affecting U.S. agriculture target the use of certain pesticides and encourage the containment of agricultural runoff. Packing house wastewater is regulated as an industrial effluent often requiring treatment at the facility prior to discharge.[86] In addition, increased attention is being focused on the need to minimize the effect of some farming practices on water and air quality, and on whether mandatory requirements may be necessary to supplement existing voluntary requirements.[87] Additional attention regarding the environmental effects of some farming

[80] Ibid.

[81] Interview with growers/packers, September 26, Yuma, Arizona.

[82] Interview with university researchers and staff, September 30, 2005, Davis, California.

[83] Ibid.

[84] "Linden," Third Party Audits, 11.

[85] Although California's average rates declined by more than 40 percent since July 2003, as of January 1, 2006 only 4 states (Alaska, Florida, Montana, and Texas) had average workers' compensation insurance premium rates higher than those in California. California State, *A Study of the Effects of Legislative Reforms,* 7.

[86] Interview with industry representative (September 29, 2005) and U.S. university researchers and staff (September 30, 2005), Davis, California. Most pesticide regulations primarily affect pesticide manufacturers who must register pesticides for use according to certain U.S. Environmental Protection Agency review protocols; however, many traditionally used pesticides have been phased out or banned from use.

[87] California EPA, "The History of the California Environmental Protection Agency;" Cash and Zilberman, "Environmental Issues in California Agriculture."

practices is expected to result in greater restrictions on U.S. grower practices that may further raise production costs.[88]

Quantitative information is not available regarding the extent to which individual grower or packer costs are affected by compliance with these types of regulations and standards. However, the costs associated with increased attention and administrative burden, as well as the modification of existing production practices and facilities to address such requirements, remains a continual concern in the U.S. industry.[89]

Costs of Production

Cost information for oranges and lemons grown in the San Joaquin Valley, California–the major U.S. growing region for fresh market citrus fruit–is available from enterprise budget data compiled by farm advisors at the University of California at Davis.[90] These enterprise budgets reflect sample costs and are primarily designed as guidelines for decision-making and as tools for projecting and comparing costs and returns, and are intended to assist managers with planning and management at individual farm operations.[91] Sample costs from these budgets are compiled using a survey interview approach based on discussions between cooperative extension staff and a minimum of five "best practices" growers who are asked about costs to develop a citrus orchard.[92] Some costs are calculated using average values and estimates reported by the American Society of Agricultural and Biological Engineers, supplemented by information obtained from interviews with growers. Sample costs reflect conditions of well-managed orchards with about 25 hectares of land. The University of California generally compiles reports for oranges and lemons every 5 years.

Packing costs are included on a per acre basis in the University of California enterprise budget reports, corroborated by average packing costs for both oranges and lemons provided to the Commission on a per carton basis by Sunkist Growers, Inc.

Total Costs

For oranges, sample farm-level production costs are about $4,355/ha, or an estimated $153/mt (table 4-14). These costs cover direct grower (variable) costs, but do not include other costs such as interest on operating capital, overhead costs, and any harvesting costs that may be incurred by the grower. Cost estimates for oranges are based on cultural and management practices for both navels and Valencias, and assume costs to grow both varieties are roughly equivalent, with only slight differences in pruning, the use of growth regulators, and other practices. Packing house (variable) costs, which include harvesting costs, are $255/mt, and do not reflect offsetting costs from pick and haul charges to growers. Total

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[88] Interview with U.S. citrus growers/packers, September 30, 2005, Davis, California.

[89] Ibid.

[90] University of California, *Sample Costs to Establish an Orange Orchard*; University of California, *Sample Costs to Establish an Lemon Orchard*.

[91] Sample costs provide a framework for analyzing production costs, but may not necessarily reflect actual costs at individual farm business (given differences in management levels, soils, weather, prices received, prices paid, fertilization and cultural practices) or average costs across a range of agricultural producers (given the range of cost and return differences among, for example, low-cost, high-performing operations and high-cost, low-performing operations). Enterprise budgets are periodically published by a number of land grant universities, in cooperation with local Cooperative Extension Service staff and USDA's Cooperative State Research, Education, and Extension Service (CSREES).

[92] Interviews and telephone correspondence with University researchers, September 30, 2005, Davis, California.

Table 4-14 Oranges: Costs of production and cost shares in San Joaquin Valley, CA

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Share of total (percent)
Farm-level (cultural) costs:			
Frost Protection (water and wind machine)	815		5
Fertilizer/weed control/soil amendment (labor and material)	1,191		7
Pruning	334		2
Irrigation (labor and water)	689		4
Insecticide/leaf analysis/disease control/PCA services	963		6
Equipment use (labor and fuel)	363		2
Total, farm-level (cultural) costs	4,355	153	27
Packing house (harvest) costs:			
Pick and haul fruit	1,778	62	11
Pack fruit	5,434	191	34
Assessments	57	2	([a])
Total, packing house (harvest) costs	7,269	255	45
Interest on operating capital @ 7.65%	346	12	2
Total, operating costs	11,970	420	74
Overhead costs:[b]			
Cash overhead	1,040	37	6
Non-cash overhead	3,218	113	20
Total, operating and overhead costs	16,228	569	100

Source: University of California Cooperative Extension, *2005 Sample Costs to Establish an Orange Orchard and Produce Oranges* (Table 3).

Note: Original cost data are not reported as farm-level and packing house costs since some aspects of fruit harvesting may be performed by the grower in some cases, such that a portion of these costs may actually be incurred at the farm-level. Converted by Commission staff from U.S. dollars per acre assuming 1 hectare = 2.47 acres. Per-unit costs calculated using the following conversion factors: average yield of 660 cartons per acre (1,603 cartons per hectare), which translates to 61,700 lbs/ha (38.5 lbs/carton) or 28.5 mt/ha. Costs are compiled assuming that packed cartons represent about 80 percent of the fruit picked, with the remaining crop sold for juicing or lost to spoilage.

[a]Less than 1 percent.
[b]Overhead costs include both cash overhead (taxes, insurance and other investment expenses) and non-cash overhead (annual capital recovery costs for land, buildings, and equipment).

operating costs, including interest on operating capital and overhead costs, are estimated at $11,970/ha, or $420/mt. Total production costs for oranges, including cash and non-cash overhead costs, are reported at $569/mt.

For lemons, sample farm-level costs are about $4,523/ha, or an estimated $116/mt (table 4-15). These costs include direct grower (variable) costs only, including cultural and management practices but excluding grower harvesting costs. Variable costs to packing houses, including harvesting costs, are about $408/mt, and do not reflect offsetting costs from pick and haul charges to growers. Total operating costs, including interest on operating capital, are estimated at $21,011/ha, or $541/mt. Total production costs for lemons, including cash and non-cash overhead costs, are reported at $643/mt.

Major Cost Components

Of the total costs reported in the enterprise budgets, harvest and packing costs are the largest components of costs, accounting for about 45 percent of the cost to grow oranges and 63 percent of the cost to grow lemons. Of total farm-level costs, chemical applications, including labor and materials, are the largest component of overall costs (accounting for

Table 4-15 Lemons: Costs of production and cost shares in San Joaquin Valley, CA

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Share of total (percent)
Farm-level (cultural) costs:			
Frost Protection (water and wind machine)	815		3
Fertilizer/weed control/soil amendment (labor and material)	1,186		5
Pruning	773		3
Irrigation (labor and water)	746		3
Insecticide/leaf analysis/disease control/PCA services	640		3
Equipment use (labor and fuel)	363		2
Total, farm-level (cultural) costs	4,523	116	18
Packing house (harvest) costs:			
Pick and haul fruit	5,627	145	23
Pack fruit	10,137	261	41
Assessments	69	2	([a])
Total, packing house (harvest) costs	15,833	408	63
Interest on operating capital @ 7.65%	655	17	3
Total, operating costs	21,011	541	84
Overhead costs:[b]			
Cash overhead	993	26	4
Non-cash overhead	2,967	76	12
Total, operating and overhead costs	24,971	643	100

Source: University of California Cooperative Extension, *2005 Sample Costs to Establish an Orchard and Produce Lemons* (Table 3).

Note: Original cost data are not reported as farm-level and packing house costs since some aspects of fruit harvesting may be performed by the grower in some cases, such that a portion of these costs may actually be incurred at the farm-level. Converted by Commission staff from U.S. dollars per acre assuming 1 hectare = 2.47 acres. Per-unit costs calculated using the following conversion factors: average yield of 900 cartons per acre (2,223 cartons per hectare), which translates to 85,600 lbs/ha (38.5 lbs/carton) or 38.8 mt/ha.

[a]Less than 1 percent.

[b]Overhead costs include both cash overhead (taxes, insurance and other investment expenses) and non-cash overhead (annual capital recovery costs for land, buildings, and equipment).

about one-half of all farm costs). Generally, California growers reported labor costs, including payroll taxes, worker benefits, and workers' compensation insurance, as the second highest component of direct grower costs after pest control and chemical inputs.[93]

Labor costs are not separately reported, but are included in the grower's itemized cultural and harvesting costs. However, based on available information in the University of California estimates, farm-level labor costs can be approximated based on reported labor costs plus custom services costs for pruning.[94] These estimated labor costs total $1,740/ha (oranges) and $1,980/ha (lemons), accounting for about 40 percent of total farm-level costs. These costs, however, do not include labor to harvest fruit, which cannot be approximated based on the available cost data.

Overhead expenses are not specifically attributed to either the grower or packing house, and cannot be broken out using the available cost data. Overhead costs include both cash overhead (taxes, insurance and other investment expenses) and non-cash overhead (annual capital recovery costs for land, buildings, and equipment). Non-cash overhead includes land

[93] Interview with U.S. citrus growers/packers, September 30, 2005, Davis, California.

[94] Estimated labor costs exclude reported consultant services but may include some equipment rental costs and contracting fees within the reported custom/rent costs.

costs, estimated at about $6,500 per producing acre ($16,055/ha) for both orange and lemon groves.

Cost Considerations

Sample costs typically reflect costs for a single region, in this case, the San Joaquin Valley. Based on Commission fieldwork, costs for orange and lemon production in other regions of California and other states, such as Arizona and Florida, are lower than those reported in the enterprise budgets presented here. Estimates of total direct grower (variable) costs for lemons grown in Yuma County, Arizona, reportedly ranged from $2,350 to $3,000/ha.[95] The lower total farm-level cost in the California desert/Arizona versus the California coast and Central Valley is reportedly due to lower labor rates (including workers' compensation insurance), taxes, water, and general and administrative costs.

Cost of production information for Florida citrus production is available in enterprise budgets prepared annually by the University of Florida for several citrus growing regions in Florida, and include production costs of fresh market oranges.[96] The Florida budgets differ from those for the San Joaquin Valley in that they do not report costs for frost protection, packing costs, or certain cash and non-cash overhead costs. In 2004-2005, sample farm-level costs to produce fresh market oranges in Central Florida were $3,574/ha. These costs do not include overhead (fixed costs), harvesting, or packing costs. Florida fresh market growers have significantly lower pruning (70 percent lower), irrigation (40 percent lower), and pest control (26 percent lower) costs than California growers.

[95] Interview with U.S. citrus growers/packers, September 30, 2005, Davis, Arizona.
[96] Muraro, *2004-2005 Citrus Budget for the Central Florida*.

CHAPTER 5
Argentina

Introduction

Argentina is a significant global producer and exporter of oranges and lemons. In 2004, Argentina was the leading producer and second-leading exporter of fresh lemons and was the twelfth leading producer and seventh leading exporter of fresh oranges.[1] Argentina's climate and soil are suitable for citrus production, and its citrus industry utilizes the latest technology. The bulk of citrus production in Argentina is destined for the domestic market, where oranges are consumed in the fresh state and lemons are processed as juice and oil. While oranges and lemons have been produced in Argentina for centuries,[2] exports only began in 1971.[3] Currently, the Argentine orange and lemon industries are increasing their focus on global export markets. Competitive advantages include suitable growing conditions, land availability, and a season that is counter to that in the major Northern Hemisphere markets. Competitive disadvantages include variable weather, phytosanitary and quality issues, and the distance to certain markets relative to competing Southern Hemisphere suppliers, mainly South Africa and Australia.

Industry Overview

Citrus production in Argentina was affected by a variety of economic, market, and weather conditions during 2000–2005. Inflation, the devaluation of its currency, and export taxes during some of the period created uncertainty among producers.[4] Weather variations throughout different stages of the annual growing cycle are typical and often result in unpredictable production levels. Phytosanitary restrictions in major export markets and prices in the domestic and processed product markets affected production levels. Recently, drought in northwestern Argentina and relatively low lemon product prices limited lemon production, while orange production benefited from favorable weather conditions.

Production Trends

Argentine production of oranges and lemons fluctuated annually during 2000-2005 (tables 5-1 and 5-2). Annual orange production ranged between about 700,000 mt and 900,000 mt during 1995-2005, and was 720,000 mt in 2005. Lemon production nearly doubled during the same period to about 1.2 million mt in 2005.[5] In 2004, lemons were the leading citrus variety produced in Argentina, accounting for about 49 percent of the total volume of citrus production.[6] Oranges were second, with a share of about 27 percent.[7] These

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[1] USDA, FAS, PSD data.
[2] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[3] Interview with Argentine research institute representatives, December 8, 2006, Concordia, Argentina.
[4] USDA, FAS, *GAIN Report* No. AR2039, 1.
[5] SAGPYA, *Producción de Cítricos en Argentina*, 2.
[6] Ibid.
[7] Production data are not available for navel oranges. However, in 2002, approximately 5 percent of planted orange hectarage was of navels.

Table 5-1 Oranges: Argentine production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	913	780	700	750	770	720
Production value (1,000 US dollars)	([a])	([a])	([a])	([a])	([a])	([a])
Bearing hectarage (1,000 hectares)	55	60	60	58	58	56
Nonbearing hectarage (1,000 hectares)	6	3	3	2	2	1
Total hectarage (1,000 hectares)	61	63	63	60	60	57
Annual yield (mt/hectare)	17	13	12	13	13	13

Source: USDA, FAS, PSD data.

[a]Data not available.

Table 5-2 Lemons: Argentine production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	1,217	1,200	1,050	1,220	1,300	1,200
Production value (1,000 US dollars)	([a])	([a])	([a])	([a])	([a])	([a])
Bearing hectarage (1,000 hectares)	40	42	44	44	44	44
Nonbearing hectarage (1,000 hectares)	4	4	1	1	1	1
Total hectarage (1,000 hectares)	44	46	45	45	45	45
Annual yield (mt/hectare)	30	29	24	28	30	28

Source: USDA, FAS, PSD data.

[a]Data not available.

shares were 37 percent and 35 percent, respectively, in 1995. Expansion of the lemon industry resulted mainly from a shift from other industries, particularly sugar, in the primary growing region of Tucumán and from contracts with major global soft drink manufacturers to supply processed lemon products.[8] The lemon industry has been shifting to higher density plantings and dwarf trees, while the orange industry has been increasing planting density and introducing new varieties.[9] As with most global citrus producers, the highest quality fruit is exported and the remainder is further processed or marketed fresh domestically.

The primary varieties of oranges grown in Argentina are Valencia, navel, and Salustiana.[10] In the northeast, where the bulk of orange production takes place, late varieties account for 87 percent of planted area, with the Valencia Late variety alone accounting for 60 percent of the planted area. Other leading varieties include Washington Navel (10 percent), Valencia Seedless (10 percent), Salustiana (7 percent), and Lane Late (4 percent). Valencia Late has maintained its dominant position during the past 5 years.[11] About 5 percent of total Argentine orange hectarage is planted with navel varieties. The primary navel varieties include Washington Navel, Lane Late, Buckeye, Navelate, and Newhall.[12] The primary lemon varieties in the northwest include Eureka Frost, Lisboa Frost, Limonera 8-A, Genova, and Femminello Santa Teresa.[13]

[8] The current largest lemon producer began producing lemon oil for a major U.S.-based soft drink company in 1953. Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.

[9] USDA, FAS, *GAIN Report* No. AR0038, 2.

[10] Interview with Argentine industry representatives, December 7, 2005, Concordia, Argentina.

[11] USDA, FAS, *GAIN Report* No. AR5034, 7.

[12] FEDERCITRUS, email correspondence, received December 24, 2005.

[13] USDA, FAS, *GAIN Report* No. AR5034, 7.

Growing Regions

The Argentine orange industry is located mainly in the northeast (68 percent of total planted area in 2004) while the lemon industry is centered in the northwest (90 percent), as shown in the following tabulations, and in figure 5-1:

Oranges: Argentine planted area by region, 2004

Region	Planted area (hectares)	Share of total (percent)
Northeast:		
Entre Ríos	20,056	36.3
Corrientes	14,761	26.7
Misiones	2,800	5.1
Total, Northeast	37,617	68.1
Northwest:		
Salta	4,730	8.6
Jujuy	4,490	8.1
Tucumán	2,700	4.9
Catamarca	1,100	2.0
Chaco	70	0.1
Formosa	115	0.2
Total, Northwest	13,205	23.9
Buenos Aires	4,415	8.0
Total, Argentina	55,237	100.0

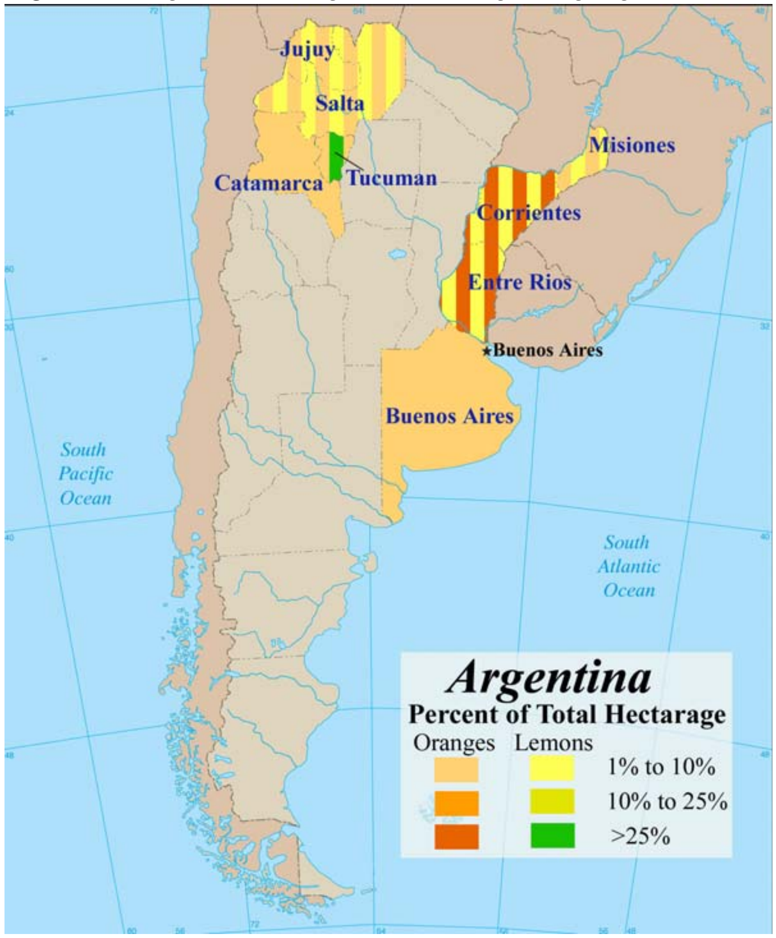
Source: FEDERCITRUS, *La Actividad Citrícola Argentina*.

Lemons: Argentine planted area by region, 2004

Region	Planted area (hectares)	Share of total (percent)
Northeast:		
Entre Ríos	996	2.3
Corrientes	2,138	4.9
Misiones	1,257	2.9
Total, Northeast	4,391	10.0
Northwest:		
Salta	1,850	4.2
Jujuy	2,138	4.9
Tucumán	35,000	79.9
Catamarca	50	0.1
Chaco	45	0.1
Formosa	196	0.4
Total, Northwest	39,279	89.6
Buenos Aires	150	0.3
Total, Argentina	43,820	100.0

Source: FEDERCITRUS, *La Actividad Citrícola Argentina*.

Figure 5-1 Argentina: Orange and lemon growing regions



These regions offer different soils and climates that affect production efficiency and product quality. The northwest is subtropical, and the northeast is drier and more temperate. The orange industry is located mainly in the Mesopotamia region between and along the Uruguay and Paraná rivers. However, a significant amount of oranges are grown in the far northwest (Salta and Jujuy) as well as in the Buenos Aires region. Production is increasing in the Misiones area, as the government of Argentina is encouraging the conversion from tobacco to alternative crops, such as oranges.[14]

Lemon production is more concentrated, with 80 percent of the planted area located in Tucumán. This area, located near the eastern edge of the Andes mountains, provides ample rainfall, good soil and drainage, and is mostly free of frost.[15] Most lemon production does not require irrigation. About one-half of lemon production in Tucumán is in a southern area, which requires no irrigation. The northern Tucumán production area is about 20–30 percent irrigated. The soil and yields are superior in the southern area, and production matures earlier than in the north.[16]

[14] USDA, FAS, *GAIN Report* No. AR5034, 3.
[15] Ibid.
[16] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.

Argentine orange and lemon growers have limited alternatives to citrus. Production generally is located in specific areas that are optimal for citrus production. Growers can change varieties in response to market conditions, but there is a significant lag time that limits the effectiveness of this strategy.[17]

Structure and Organization

The Argentine citrus industry is composed of approximately 5,300 growers, 529 packing houses (79 of which pack fruit for export), and 16 processing plants; direct labor totals about 100,000 workers.[18] There are about 300 lemon producers and 50 packing houses in Tucumán.[19] Additionally, there are 2 lemon packers in the northeast and 4 or 5 in the Jujuy and Salta area in the northwest.[20]

Farms growing oranges in Argentina range from relatively small, independent units of less than 25 ha,[21] to larger units in excess of 100 ha that are generally owned by integrated firms.[22] Lemon production is more concentrated, with vertically-integrated companies holding relatively large amounts of hectarage. The farm owned by the largest lemon producer is 1,200 ha.[23] The average lemon farm in the Tucumán region is about 200 ha.[24] About 60 percent of lemon production is accounted for by 16 percent of producers in Tucumán.[25]

Packing houses are located in the vicinity of citrus groves. Larger growing operations generally are integrated and have their own packing house. A typical packing house that exports fresh oranges or lemons may employ 300-400 workers, process 15-30 mt per hour, and have a cold storage capacity of 3,000 mt.[26]

The larger, export-oriented Argentine orange and lemon producers generally are integrated operations. Such producers typically own nurseries, citrus groves, and packing houses. This integration facilitates the control of quality and costs and enhances the ability to comply with strict standards in export markets. Producers may contract for additional fruit if their holdings are insufficient.

Argentine orange and lemon producers have formed regional and national associations. The major ones include the Federación del Citrus de Entre Ríos (Fecier), the Tucumán Citrus Association, and the Federación Argentina del Citrus (FEDERCITRUS). These organizations generally provide market information to members, support research and development, and represent members' interests with respect to government policy and programs. The associations are funded by members.

[17] A citrus tree may take up to 7 years to reach maximum production.
[18] FEDERCITRUS, *La Actividad Citrícola Argentina*, 5.
[19] Interview with Argentine trade association representatives, December 5, 2005, Tucumán, Argentina.
[20] Interview with Argentine trade association representatives, December 9, 2005, Buenos Aires, Argentina.
[21] USDA, *GAIN Report* No. AR5034, 3.
[22] Interview with Argentine industry representatives, December 7, 2005, Concordia, Argentina.
[23] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[24] Interview with Argentine trade association representatives, December 5, 2005, Tucumán, Argentina.
[25] Ibid.
[26] Interview with Argentine industry representatives, December 6, 2005, Tucumán, Argentina. Data include other citrus, such as mandarins.

Market Overview

Production Utilization

Argentine citrus marketing channels vary substantially by product. The Argentine orange industry traditionally has been oriented toward the domestic fresh market, which accounted for 52 percent of output in 2004.[27] A significant share, 17 percent, of orange output is processed, mainly into frozen concentrated orange juice. However, such production has declined in recent years. The export market accounts for about one-fifth of total output. The bulk of Argentine lemon production, 69 percent in 2004, is processed into such products as lemon juice and concentrate, oil, and peel.[28] The fresh export market accounted for nearly one quarter of total output in 2004. Contracts with multinational soft drink companies led to the dominance of the processing sector. However, the export of fresh lemons has increased in recent years, as the Argentine industry has developed new markets and seeks to spread risk and increase revenues.

Domestic Consumption

Argentine domestic consumption of oranges has been in a long-term decline, falling by nearly one-fourth during 2000-2004 (table 5-3). Consumption of lemons also has been declining over the long run, but recovered slightly during 2003 and 2004 (table 5-4). Imports generally are minor for both oranges and lemons. Factors contributing to the declines in consumption include economic and financial difficulties during the period that limited disposable income, weather-related variations in production, and an increasing share of output destined for export markets.[29]

Table 5-3 Oranges: Argentine imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000–2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	913	12	40	885	1	4
2001	780	7	107	680	1	16
2002	700	([a])	85	615	([b])	12
2003	750	([a])	78	672	([b])	10
2004	770	1	158	613	([b])	21
2005	720	([a])	168	562	([b])	23

Source: USDA, FAS, PSD data; Global Trade Atlas.

[a]Less than 500 mt.
[b]Less than 0.5 percent.

[27] FEDERCITRUS, *La Actividad Citrícola Argentina*, 6.
[28] Ibid.
[29] USDA, FAS, *GAIN Report* Nos. AR3020 and AR5016, 1 and 3.

Table 5-4 Lemons: Argentine imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000–2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	1,217	([a])	204	1,013	([b])	17
2001	1,200	([a])	245	955	([b])	20
2002	1,050	([a])	268	782	([b])	26
2003	1,220	([a])	337	883	([b])	28
2004	1,300	([a])	320	980	([b])	24
2005	1,200	([a])	367	833	([b])	31

Source: USDA, FAS, PSD data; Global Trade Atlas.

[a]Less than 500 mt.
[b]Less than 0.5 percent.

Per capita consumption of fresh market oranges declined from 20.6 kg in 1984 to 10.8 kg in 2004, while that of lemons declined from 11.1 kg to 1.6 kg.[30] It is likely that this long-term decline in fresh citrus consumption is a result of a shift to further-processed and convenience food items by consumers as disposable income rose.[31] Despite this decline in per-capita consumption, such consumption is still above the world average.[32]

Pricing and Marketing

Traditionally strong domestic demand for citrus as well as the development of the lemon processing industry has benefitted Argentine exports of oranges and lemons. Producers generally divert the highest quality fruit to the fresh export market, and the strong domestic and processing markets have provided a larger base from which to export. Prices in export markets are substantially higher than in domestic markets, and producers strive to maximize their yield of export-quality fruit.

The bulk of Argentine citrus marketed domestically is distributed through the Central Market of Buenos Aires. The Central Market distributes about 40 percent of total Argentine citrus production destined for the fresh market and 50 percent of such citrus produced in the Entre Ríos region.[33] About one-fourth of domestic fresh orange consumption and two-thirds of such lemon consumption is handled by the Central Market.[34]

Market timing is a significant competitive factor in export markets. Argentine citrus producers, particularly orange producers, have made efforts to increase shipments to export markets during low-volume periods in those markets in order to capture price premiums. Such efforts mainly have involved the use of early or late varieties as opposed to holding product in inventory. Lemon production in Tucumán occurs in two distinct areas with different harvesting seasons. Lemons produced in the southern area mature earlier, but they compete during the same time as those of Spain and Turkey in the EU market.[35]

[30] FEDERCITRUS, *La Actividad Citrícola Argentina*, 6.
[31] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[32] FAOSTAT data (2005).
[33] Corporación del Mercado Central de Buenos Aires.
[34] Ibid; USDA, FAS, *GAIN Report* No. AR5034.
[35] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.

Because of short-term variations in factors such as supply and demand conditions and product quality, pricing in the Argentine fresh citrus market generally is on consignment and can fluctuate significantly, as is the case for most perishable products. Pricing for the processing sector generally is negotiated for a season; therefore, variations are not as prevalent in this market. Producers generally do not hold fruit in cold storage for long periods, but rather send it to market terminals or processing plants soon after harvest.

Domestic wholesale prices for oranges and lemons fell during 2000-2002 before recovering during 2003-2005 (table 5-5). This trend largely followed domestic economic conditions that affected consumers' disposable income.

Table 5-5 Oranges and lemons: Argentine wholesale prices, 2000-2005 (US dollars/kg)

Item	2000	2001	2002	2003	2004	2005
Oranges	0.44	0.24	0.11	0.19	0.21	0.17
Lemons	0.30	0.28	0.13	0.16	0.19	0.19

Source: USDA, FAS, GAIN reports.

There is a distinct seasonal pattern to domestic fresh orange and lemon prices in Argentina. Prices are directly inverse to supplies, with peak prices in the offseason period, October through April (table 5-6).

Table 5-6 Oranges and lemons: Argentine monthly domestic wholesale prices, 2005 (US dollars/kg)

Item	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Oranges	0.15	0.21	0.15	0.17	0.17	0.18	0.17	0.15	0.15	0.18	0.19	0.14
Lemons	0.21	0.30	0.22	0.21	0.18	0.17	0.16	0.15	0.15	0.15	0.18	0.17

Source: USDA, FAS, GAIN reports.

International Trade

Exports and Imports

The Argentine citrus industry is a significant citrus exporter, particularly of fresh lemons. Argentina ranked first among global lemon exporters and fifth among orange exporters in 2004.[36] Argentina is also the leading exporter of lemon juice. Lemons accounted for 58 percent of the quantity and 60 percent of the value of Argentina's total citrus exports in 2004.[37] Oranges accounted for 25 percent of the quantity and 20 percent of the value that year.

Argentina's principal markets include the EU (the Netherlands, Spain, Belgium, and Italy) and Russia (tables 5-7 and 5-8). A sluggish domestic market, a currency devaluation, sustained demand in the EU, a strengthening euro vis-à-vis the U.S. dollar, the development of the Russian market, and periodic droughts in South Africa all contributed to a general

[36] Estimated based on data from the USDA, FAS, PSD database, and FAOSTAT database. Rankings exclude intra-EU trade.

[37] USDA, FAS, *GAIN Report* No. AR5034.

Table 5-7 Fresh oranges: Argentine exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Russia	8,413	13,899	3,936	6,909	40,641	63,153
Netherlands	15,378	16,467	18,146	19,134	44,762	20,041
Spain	4,121	37,565	16,587	23,411	18,824	19,739
Belgium	7,160	11,087	12,737	10,502	13,394	10,751
Ukraine	218	1,425	1,642	1,359	3,142	5,543
All other	4,932	26,959	31,777	16,819	37,273	48,636
Total	40,222	107,402	84,825	78,134	158,036	167,863
	Value (1,000 dollars)					
Russia	3,105	5,508	1,149	2,264	13,360	18,485
Netherlands	5,211	5,717	4,325	5,001	14,464	6,856
Spain	1,431	13,788	3,631	7,110	5,952	6,585
Belgium	3,291	5,687	4,069	3,466	4,706	3,925
Ukraine	100	608	538	463	1,119	2,035
All other	1,877	9,403	3,879	4,178	9,609	8,342
Total	15,015	40,711	17,591	22,482	49,210	46,228
	Unit value (dollars per metric ton)					
Russia	369	396	292	328	329	293
Netherlands	339	347	238	261	323	342
Spain	347	367	219	304	316	334
Belgium	460	513	319	330	351	365
Ukraine	459	427	328	341	356	367
All other	381	349	122	248	258	172

Source: Global Trade Atlas.

Table 5-8 Fresh lemons: Argentine exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Spain	17,441	27,227	36,176	56,074	31,491	71,063
Russia	31,851	39,895	53,009	61,227	65,651	58,761
Italy	21,791	25,505	33,602	50,027	44,102	45,837
Netherlands	52,753	44,307	35,679	55,137	42,503	41,285
Belgium	8,261	17,774	23,029	16,139	21,403	31,202
All other	75,898	98,498	86,219	98,211	114,771	119,346
Total	204,110	244,955	267,714	336,815	319,921	367,494
	Value (1,000 dollars)					
Spain	7,670	12,430	12,235	22,419	13,096	26,892
Russia	13,719	16,930	16,974	22,772	25,305	23,905
Italy	9,430	10,532	10,459	19,009	17,998	18,744
Netherlands	22,645	18,344	10,967	20,491	16,354	15,675
Belgium	4,376	9,523	8,111	6,737	9,625	13,741
All other	32,428	33,101	28,562	39,369	47,531	49,270
Total	94,153	109,111	87,308	130,797	129,909	148,227
	Unit value (dollars per metric ton)					
Spain	440	457	338	400	416	378
Russia	431	424	320	372	385	407
Italy	433	413	311	380	408	409
Netherlands	429	414	307	372	385	380
Belgium	530	540	352	417	450	440
All other	427	336	331	401	414	413

Source: Global Trade Atlas.

increase in Argentine fresh orange exports during 2000-2005.[38] Such exports totaled $46 million in 2005. Argentine citrus exports meet the quality standards of EurepGAP; however, an outbreak of black spot disease temporarily interrupted exports to the EU in 2003 and 2004.[39] Exports resumed in 2004 after adjustments were made to prevent shipments of affected fruit.[40] Argentina currently cannot export oranges to the U.S. market, because of U.S. phytosanitary restrictions.[41]

Argentine fresh lemon exports accounted for 17-31 percent of annual production during 2000-2005. If processed products, mainly juice, are considered, this share is substantially higher. Primary markets included Russia and the EU (Italy, Netherlands, Spain, and Greece). As with oranges, the U.S. market is not available to Argentine lemon exports because of U.S. phytosanitary restrictions on citrus canker.[42] Argentina gained access to the Japanese lemon market in 2003, but exports have been relatively minor.[43] Exports generally rose during 2000-2005, reaching $148 million the latter year.

Argentina is a minor importer of fresh oranges and lemons (tables 5-9 and 5-10). Ample domestic supplies, relatively low domestic market prices, and limited disposable income have contributed to low import levels.

Competitive Factors

Argentina possesses a suitable climate and ample land and water for citrus production. Labor generally is available, and producers are increasingly employing the latest technologies and agricultural practices to produce export-quality fruit. However, occasional volatility in weather and humid conditions in some areas have a negative impact on quality, and production costs have been increasing in recent years for most cost items. Phytosanitary issues, mainly citrus canker and black spot, have limited exports in recent years. Argentina's location in the Southern Hemisphere makes its citrus production counterseasonal to competition from domestic industries in major export markets in the EU and Russia. However, Argentina does compete with other major Southern Hemisphere exporters, such as South Africa and Australia.

Natural Endowments

Argentine orange and lemon production is located mainly in humid, subtropical climatic zones. Most oranges are produced in the Mesopotamia region, while lemons are produced mainly in warmer climatic conditions further north, in the Tucumán area. Soil types range

[38] USDA, FAS, *GAIN Reports* Nos. AR2039, AR4060, and AR5034, 5; Interview with Argentine industry representatives, December 7, 2005, Concordia, Argentina.

[39] USDA, FAS, *GAIN Report* No. AR4029, 7.

[40] USDA, FAS, *GAIN Report* No. AR5016, 6.

[41] Phytosanitary issues are discussed in the section "Pest and Diseases" below.

[42] USDA, FAS, *GAIN Reports* Nos. AR0079, and AR2039, 1 and 5. Access had been granted in 2000 but was rescinded in 2001 after a U.S. federal court ruled that the initial pest risk assessment was flawed. A new pest risk assessment is in progress.

[43] USDA, *GAIN Reports* No. AR3020, and AR3048, 2 and 4. Japan requires cold treatment for such exports, which negatively affects quality. Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.

Table 5-9 Fresh oranges: Argentine imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Uruguay	63	111	0	3	599	0
Chile	1,564	313	0	41	101	0
Mexico	2,350	1,873	96	0	0	0
Israel	2,062	999	0	0	0	0
Cuba	0	([a])	0	0	0	0
All other	6,072	3,238	154	291	0	([a])
Total	12,111	6,534	250	335	700	([a])
	Value (1,000 dollars)					
Uruguay	15	31	0	([b])	88	0
Chile	897	148	0	13	44	0
Mexico	1,028	776	42	0	0	0
Israel	1,270	642	0	0	0	0
Cuba	0	([b])	0	0	0	0
All other	3,484	1,872	90	94	0	([b])
Total	6,694	3,469	132	107	132	([b])
	Unit value (dollars per metric ton)					
Uruguay	230	280	([c])	150	150	([c])
Chile	570	470	([c])	330	440	([c])
Mexico	440	410	440	([c])	([c])	([c])
Israel	620	640	([c])	([c])	([c])	([c])
Cuba	([c])	1,230	([c])	([c])	([c])	([c])
All other	570	580	580	320	([c])	1,292

Source: Global Trade Atlas.

[a]Less than 1.
[b]Less than $500.
[c]Not available.

Table 5-10 Fresh lemons: Argentine imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Argentina	0	0	23	23	23	0
Uruguay	78	0	0	13	0	0
Spain	131	322	71	0	0	0
Chile	18	0	0	0	0	0
Cuba	4	0	0	0	0	0
Brazil	([a])	([a])	0	0	0	0
Total	232	322	94	37	23	0
	Value (1,000 dollars)					
Argentina	0	0	75	15	12	0
Uruguay	24	0	0	4	0	0
Spain	122	315	([b])	0	0	0
Chile	12	0	0	0	0	0
Cuba	5	0	0	0	0	0
Brazil	1	1	0	0	0	0
Total	165	316	75	19	12	0
	Unit value (dollars per metric ton)					
Argentina	([c])	([c])	390	470	540	([c])
Uruguay	300	([c])	([c])	310	([c])	([c])
Spain	930	980	920	([c])	([c])	([c])
Chile	690	([c])	([c])	([c])	([c])	([c])
Cuba	1,250	([c])	([c])	([c])	([c])	([c])
Brazil	633	478	([c])	([c])	([c])	([c])

Source: Global Trade Atlas.

[a]Less than 1.
[b]Less than $500.
[c]Not available.

from sandy in Mesopotamia to loam in Tucumán.[44] Topography ranges from flat, alluvial plains in Mesopotamia to the eastern slope of the Andes in Tucumán.

Argentina's subtropical climate and generally abundant rainfall lessen the need for irrigation and frost measures, such as heaters and blowers. However, the warm, humid conditions foster the growth of certain fungi and diseases, require increased use of fungicides, and lower the yield of export-quality fruit. Seasonal weather volatility also affects the competitiveness of the industry. For example, drought in Tucumán in recent years reduced lemon production, and damage from wind and hail periodically affects lemon and orange quality. The industry has been taking measures to address these problems, such as increasing the use of irrigation and planting wind barriers around citrus groves.[45]

Water Issues

Argentina generally has ample water supplies for orange and lemon production. There usually is sufficient rainfall, and most orange production is located adjacent to major rivers, which provide ample supplies of water for irrigation. Lemon production is centered in a

[44] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina. Interview with Argentine research institute representatives, December 8, 2006, Concordia, Argentina.
[45] Interview with Argentine industry representatives, December 5-9, 2005, Tucumán, Concordia, and Buenos Aires, Argentina.

subtropical region with abundant rainfall in most years.[46] Thus, irrigation costs are relatively minor in Argentine citrus production. However, the expanding use of irrigation to improve the yield of export-quality fruit likely will increase production costs in the future.[47]

Pests and Diseases

Argentine orange and lemon production is affected by a variety of insects and diseases, largely resulting from humid climatic conditions. The most prominent are citrus canker and black spot.[48] Citrus canker has prevented the export of lemons to the United States since September 2001, and black spot has interrupted exports of citrus to the EU in recent years. Tropical conditions in Tucumán foster the growth of fungi.[49]

The humid, subtropical climate in Argentina requires increased use of agricultural chemicals, such as fungicides, which increases production costs. In addition, costs are incurred developing and using rootstock that is resistant to viruses. Moreover, the use of certain pesticides and other chemicals is restricted by export markets.

Seasonality

The marketing season for oranges in Argentina is generally between April and September, depending on the variety, as shown in the following tabulation. Lemons are marketed between February and December. There are two peak seasons for lemons produced in Tucumán: April-May, and August-early December, as shown in the following tabulation:

Oranges and lemons: Argentine marketing seasons by variety

Variety	Marketing season
Oranges:	
Navelina	April-August
Salustiana	May-July
Washington Navel	May-June
Navel Late	June-August
Valencia Seedless	June-September
Valencia Late	June-September
Lemons:	
Genova	February-December
Eureka	February-December

Source: FEDERCITRUS, *Argentina, The South America citrus land;* Argentine industry representative.

Seasonality has been a major contributing factor in the introduction of new citrus varieties designed to enter export markets during off-peak windows in order to capture higher prices. Argentine exporters increasingly are attempting to market in the early and late parts of the

[46] However, a recent drought affected citrus production in the Tucumán area.
[47] USDA, FAS, *GAIN Report* No. AR5016, 6.
[48] Ibid. Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[49] USDA, FAS, *GAIN Report* No. AR2039, 2.

season when volume from competitors is lower in order to capture higher prices in major export markets.

Labor

The Argentine citrus industry generally has access to sufficient labor. Competition from other industries is limited, as growing and packing operations tend to be concentrated in citrus-producing areas. In Tucumán, the mechanization of the sugar industry in recent years led to a labor surplus, which was absorbed by the lemon industry.[50] There are approximately 40,000-45,000 citrus workers in the Tucumán region.[51] Field workers are paid a minimum daily rate based on a minimum number of boxes picked. In December 2005, the rate was 35 pesos per day ($11.67) (plus 50 percent benefits, bringing the total to 50 pesos ($16.67) based on 28 boxes (20 kilograms each).[52] Workers are paid extra for additional boxes. As of December 2005, packing plant workers generally were paid the minimum wage, approximately 4.50 pesos ($1.50) per hour (880 pesos ($293.33) per month), plus 50 percent additional for benefits.[53] This has increased by 100 pesos ($33.33) per month in 2006. Some producers provide incentives, such as bonuses, to retain skilled workers, and government regulations require packers to offer jobs in the peak season to returning workers.[54]

Although labor is generally available, it is a major cost item in the production of citrus, particularly with respect to export-quality fruit which requires cultural practices such as more intensive pruning and manual picking. Recent increases in labor costs will negatively affect the competitiveness of the Argentine citrus industry. However, labor costs in Argentina generally are lower than in Northern Hemisphere production areas, namely the United States and the EU, and in Australia.

Yields

Average yields for orange production in Argentina ranged between 12-17 mt/ha during 2000-2005, while yields for lemon production varied between 24-30 mt/ha (tables 5-1 and 5-2).[55] Yields are subject to significant annual variations, mainly resulting from climatic conditions such as rain, wind, and frost. The timing of weather conditions relative to critical stages of the production cycle, such as bud set and blossoming, also affects yields.

Yields in the Argentine orange industry generally lag those in major competing countries and are below the world average, which is about 18 mt/ha. Lemon yields exceed those in competing countries and the world average of 17 mt/ha.[56] The relative position of Argentina with respect to yields is a major competitive factor. Argentina's dominance in lemon exports largely results from high yields. Efforts to improve cultural practices are driven mainly by yield considerations. Yields in export-oriented citrus groves are substantially higher than

[50] Interview with Argentine industry representatives, December 6, 2005, Tucumán, Argentina.
[51] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[52] Ibid. Interview with Argentine industry representatives, December 7, 2005, Concordia, Argentina.
[53] Interview with Argentine industry representatives, December 6, 2005, Tucumán, Argentina.
[54] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[55] Yields are substantially higher for export-oriented operations utilizing agricultural practices such as irrigation, pruning, and weed control.
[56] Based on FAOSTAT data (2005).

those in traditionally-managed groves, with lemon yields ranging from 60 to 100 mt/ha and orange yields ranging from 30 to 50 mt/ha in groves managed for exports.[57]

Cultural Practices

Most orange and lemon producers in Argentina have implemented cultural practices to produce fruit of acceptable quality for export.[58] Practices such as pruning, drip or microirrigation, weed and pest control, grafting, high-density planting, and the use of certified virus-free rootstock have become standard in the industry as a way to maximize the yield of export-quality fruit in the orchards. Fruit of lesser quality is shipped for domestic fresh consumption and for processing. Some producers target the domestic or processing market, but they represent a small and shrinking share of total output.

The use of good agricultural practices in the Argentine orange and lemon industries increases production costs but is viewed as essential to produce export-quality fruit. Additionally, the substantial price premium in export markets compared to the domestic fresh and processing markets reportedly offsets the costs of these practices. For example, the average FOB export unit value was $406/mt in 2004, while prices for lemons destined for processing were $50-$60/mt in 2004.[59] The Argentine citrus industry and government are committed to increasing the use of good agricultural practices with a view towards increasing exports.[60] For example, a national strategic plan is being developed, in part, to improve quality in order to increase exports.[61]

Production Technology

The Argentine citrus industry generally employs the latest technology throughout the production chain. Growers utilize methods such as grafting techniques, virus-free rootstock, pest and disease control measures, high-speed sorting and packing machinery, cold-chain maintenance, and traceability.[62] Cold treatment is required by some export markets as a phytosanitary measure; such treatment usually is applied in transit. The industry increasingly is focused on high-value export markets and employs technologies in order to meet quality standards and phytosanitary requirements in those markets.[63] The use of state-of-the-art technology generally is considered by the Argentine industry and government to be necessary in order to participate in export markets.[64] The use of such technology also incurs higher costs, but results in greater yields.[65]

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[57] Interview with Argentine research institute representatives, December 8, 2005, Concordia, Argentina. Interview with Argentine government officials, December 6, 2005, Tucumán, Argentina.

[58] USDA, FAS, *GAIN Report* No. AR5016, 5; Global Trade Atlas. Interviews with Argentine industry representatives, December 5–9, 2005, Tucumán, Concordia, and Buenos Aires, Argentina.

[59] USDA, FAS, *GAIN Report* No. AR5016, 5; Global Trade Atlas.

[60] Interviews with Argentine industry representatives, December 5–9, 2005, Tucumán, Concordia, and Buenos Aires, Argentina.

[61] Ibid.

[62] Ibid. Interviews with Argentine industry representatives and government officials, December 5–9, 2005.

[63] USDA, FAS, *GAIN Report* No. AR4060, 8-9.

[64] Interviews with Argentine industry representatives, December 5–9, 2005, Tucumán, Concordia, and Buenos Aires, Argentina.

[65] Interviews with Argentine industry representatives, December 7, 2005, Concordia, Argentina.

Government Policies and Support

Government support of the Argentine citrus industry traditionally has been limited. The main role of the federal and provincial governments is to provide support in general activities, such as phytosanitary regulation, industry and market information collection and dissemination, and trade negotiations. The Instituto Nacional de Tecnología Agropecuaria, an independent agency of the Federal Secretary of Agriculture, Livestock, Fisheries and Food, Ministry of Production, comprises 42 experimental stations, 240 extension and technology transfer units, and 13 research institutes throughout Argentina, including areas producing citrus.[66] There is also an agricultural research station in Tucumán, the Estación Experimental Agroindustrial Obispo Colombres, that is funded mainly by levies on producers.[67] The station has a specialized citrus research program that studies issues such as varieties, pest and diseases, cultural practices, and postharvest methods.

The federal and 13 provincial governments recently agreed to launch the National Citrus Industry Program.[68] The objectives of the program are to improve phytosanitary conditions for citrus growers, improve the sustainability of citrus production, provide market studies, develop production and marketing strategies, foster interaction between the public and private sectors regarding citrus activities, and improve the socio-economic conditions of agricultural workers.[69]

Regulatory Compliance

The Argentine citrus industry has been taking measures to expand its compliance with export-oriented regulations and requirements. The Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA) is the regulatory authority that implements and administers regulations regarding domestic and export phytosanitary and food safety issues.[70] Such issues range from the certification of virus-free rootstock to the inspection and certification of citrus exports. To gain access to major markets such as Japan and the EU, Argentine exports must meet strict phytosanitary protocols and quality standards. SENASA currently is working with the U.S. Animal and Plant Health Inspection Service in an attempt to meet U.S. phytosanitary regulations regarding citrus canker. Compliance with export-oriented requirements results in increased costs, but enables participation in substantially higher-price markets compared with the domestic fresh and processing markets. For example, a recent measure taken in response to an outbreak of black spot resulted in additional costs of $40,000 per packing house in order to meet the requirements of an EU protocol.[71] With respect to labor, growers and packers are subject to Argentine labor laws regarding minimum wages and the number of work hours as well as work conditions.[72]

[66] See *http://www.inta.gov.ar/ins/en/organization.htm* for more information.

[67] Interview with Argentine research institute representatives, December 8, 2006, Concordia, Argentina.

[68] Interview with Argentine government officials, December 9, 2005, Buenos Aires, Argentina.

[69] SAGPYA "Contract between the Secretary of Production of the Province of Entre Ríos and the Federal Secretary of Agriculture, Livestock, Fisheries and Food."

[70] For more information, see *http://www.senasa.gov.ar/vegetal/lvegetal.php*.

[71] USDA, FAS, *GAIN Report* No. AR5016.

[72] Interviews with Argentine industry representatives, December 5–9, 2005, Tucumán, Concordia, and Buenos Aires, Argentina.

Business Climate and Investment

The business and investment climate in Argentina generally welcomes foreign participation.[73] Foreign-owned firms generally receive national treatment with respect to business operations, including investment and taxation. However, the recent Argentine economic crisis and currency devaluation affected the cost and availability of capital to the citrus industry.[74] Local banks were unable to provide loans at competitive rates. Loans originally in dollars were converted to pesos in February 2002, and exporters benefited from the devaluation. Furthermore, the appreciation of the euro vis-à-vis the U.S. dollar further benefited exporters to the EU.[75] Prime lending rates in Argentina ranged between about 5–8 percent in 2005.[76] Such rates peaked in excess of 100 percent in 2002. Corporate taxes in Argentina are relatively high, with a maximum rate of 35 percent.[77] However, the tax environment is considered to be stable.[78]

Trade-Related Issues

Trade policy generally has not been a major competitive issue in the Argentine citrus industry. Argentina is not a significant importer, and domestic market prices and consumer purchasing power are relatively low. Import tariffs are 10 percent ad valorem for countries outside Mercosur and zero for Mercosur members. Export taxes have been an issue in the past, but currently such taxes are relatively low and are rebated.[79]

Exchange rate movements have had varying effects on the competitiveness of Argentine orange and lemon exports. The Argentine export industry generally operates using U.S. dollars, and the general depreciation of the Argentine peso vis-à-vis the U.S. dollar during the period under review provided a price advantage and increased returns. However, prices increased for some imported production inputs, such as agricultural chemicals, increasing costs. Also, the relatively strong euro vis-à-vis the U.S. dollar in recent years provided an additional advantage to Argentine citrus exporters in the EU market.

Costs of Production

Cost information for oranges are based on data from a periodic survey of citrus industry participants in Entre Ríos, published by the Instituto Nacional de Tecnología Agropecuaria (INTA). These data represent average costs of export-oriented operations with between 60–100 ha of 12-year-old trees in the Entre Ríos province, the primary orange production region. Packing costs are for Valencia oranges; but costs for navel oranges are believed to be similar. Cost data for lemons are based on information gathered during Commission field visits and interviews in Tucumán with producers. Data for lemons represent large-scale producers in the Tucumán province, the primary lemon production region, utilizing cultural practices suitable for export markets. All cost data reflect conditions as of December 2005.

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[73] See, for example, U.S. Department of Commerce, "Doing Business in Argentina."
[74] USDA, FAS, *GAIN Report* No. AR4060, 7.
[75] USDA, FAS, *GAIN Report* No. AR4029, 7.
[76] Banco Central, "Tasas de Interés."
[77] Latin Business Chronicle, "Corporate Tax Rates."
[78] The Heritage Foundation, *2006 Index of Economic Freedom*.
[79] USDA, FAS, *GAIN Report* No. AR3048, 5. Export taxes range from 2.7-5.0 percent.

Total Costs

Argentine farm-level production costs for fresh navel oranges for export totaled $1,569/ha, or about $51/mt (table 5-11). Harvesting and transport of fruit to the packing house totaled another $73/mt. Packing house costs, including the additional cost for export-quality fruit, totaled $164/mt. Including other export-related costs ($132/mt), total costs are reported at $421/mt ($6.31 per 15 kg box). Farm-level costs for Argentine fresh lemons for export totaled approximately $1,935/ha, or about $40/mt (table 5-12). Harvesting costs added an additional $44/mt in costs. Packing and marketing costs totaled $267/mt and reflect the higher cost for export quality fruit. Total industry-reported costs are $427/mt ($7.68 per 18 kg box).

Major Cost Components

Farm-level costs, excluding harvesting, account for only about 10 percent of the total product value of Argentine fresh oranges and lemons destined for the export market (tables 5-11 and 5-12). Farm costs include labor (hired and contract),[80] chemical inputs, fuel and repairs, and other production inputs and treatments to comply with phytosanitary requirements. Only cost data for oranges include land rental costs, which are reported to be low in terms of the overall farm costs. Harvesting, which consists mostly of labor costs, accounts for another 10 percent (oranges) to 17 percent (lemons) of total product value. Packing house costs account for the bulk of costs, estimated at about 40 percent (oranges) to 60 percent (lemons). These costs include packing labor and materials costs, and account for generally higher costs of export-quality fruit. Export and marketing costs account for 18 percent (lemons) to 31 percent (oranges) of the estimated total costs to deliver fresh oranges and lemons for export from Argentina.

Table 5-13 provides other direct farm-level input costs from INTA, including chemicals, machinery, and labor costs during 2003-2005. Chemical inputs accounted for the largest share of direct costs, 45 percent, in 2005, followed by labor (43 percent) and machinery (12 percent). Direct costs do not include harvesting, which involves a substantial amount of labor. Total chemical costs were about $530/ha in 2005.

Direct production costs for navel oranges have risen substantially in recent years, nearly doubling during 2003–2005. Labor costs are reported at about $520/ha in 2005. Labor costs rose more than seven-fold, as substantial additional costs were incurred in 2005 to clean orchards. Other labor cost items generally doubled during the period. The cost of chemical inputs rose by 36 percent during the period, led by a 76 percent rise in the cost of fungicides and insecticides used for phytosanitary controls. This increase likely resulted from a combination of rising prices, a strengthening exchange rate, and increased use owing to disease problems. Machinery cost declined by 10 percent during 2003–2005.

[80] Labor costs may not be specifically itemized, but included as part of the overall costs of a particular cost component such as pruning, cultural practices, or chemical applications.

Table 5-11 Navel oranges: Argentine costs of production, distribution, and cost shares, 2005

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Value (US dollars/ 15 kg carton)	Share of total (percent)
Farm-level costs:				
Direct costs:				
Fertilizers	203			13
Herbicides	50			3
Phytosanitary measures	385			25
Pest control	16			1
Pruning	471			30
Cultural practices	29			2
Subtotal	1,154			74
Operating capital interest expense	40			3
Total, direct costs	1,194			76
Fixed costs:				
Farm capital:				
Amortization of improvements	20			1
Interest expense of improvements	6			0
Land rent	8			0
Total, farm capital	33			2
Planting capital:				
Amortization	122			8
Interest	31			2
Total, planting capital	153			10
Development capital:				
Amortization	115			7
Interest	34			2
Total, development capital	149			9
Technical assistance expenditures	3			0
Fees, insurance, and other	36			2
Total, fixed costs	374			24
Total, farm level costs	1,569			100
Farm costs	1,569	51	0.76	12
Harvest and freight costs		73	1.10	17
Packing house costs:				
Fruit cost[a]		51	0.76	
Packing cost		114	1.71	
Total, packing house cost		164	2.46	39
Export costs:				
Cartons		50	0.75	
Freight to port		40	0.60	
Commission		42	0.63	
Total, export costs		132	1.98	31
Total costs		421	6.31	100

Source: Compiled by the Commission based on data from Instituto Nacional de Tecnología Agropecuaria (INTA), Entre Ríos province, Argentina. Converted by Argentine industry representatives assuming a farm yield of 31 mt/ha and an exchange rate of $1 = 3 pesos. All cost data reflect conditions as of December 2005. May not add due to rounding.

[a]Adjustment to account for higher costs of export-quality fruit, assuming a 50 percent yield of export-quality fruit and an adjustment for fruit used for processing. Excludes other farm and harvest costs shown.

Table 5-12 Lemons: Argentine costs of production, packing and marketing, and cost shares, 2005

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Value (US dollar/ 18 kg carton)	Share of total (percent)
Farm-level costs:				
Mechanized tasks:				
Labor	165			8
Fuel	76			4
Repairs	47			2
Amortization	70			4
Contract labor	166			8
Other	58			3
Total, mechanized tasks	582			29
Inputs:				
Oils	215			11
Fertilizers	192			10
Fungicides	497			25
Herbicides	14			1
Insecticides	40			2
Phytosanitary treatments	68			3
Total, inputs	1,026			51
Manual tasks	135			7
Administrative costs	250			13
Total, farm-level costs	1,935			100
Farm costs	1,935	40	0.72	9
Harvesting costs		44	0.79	10
Packing house costs:				
Costs of fruit[a]		115	2.07	
Packing costs		83	1.50	
Packing materials		69	1.25	
Total, packing house costs		267	4.81	63
Marketing and administrative costs		75	1.35	18
Total costs		427	7.68	100

Source: Compiled by the Commission based on field interviews and data provided by major Argentine lemon producers. Converted by Argentine industry representatives assuming a farm yield of 50 mt/ha and an exchange rate of $1 = 3 pesos. The packing house yield for oranges for export is assumed to be 50 percent. All cost data reflect conditions as of December 2005. May not add due to rounding.

[a]Adjustment to account for higher costs of export-quality fruit, assuming a 35 percent yield of export-quality fruit and an adjustment for fruit used for processing. Excludes other farm and harvest cost shown.

Table 5-13 Navel oranges: Argentine direct farm costs by input, and cost shares, 2003-2005

Cost component	2003 Value (US dollars/ha)	2003 Share of total (percent)	2004 Value (US dollars/ha)	2004 Share of total (percent)	2005 Value (US dollars/ha)	2005 Share of total (percent)
Chemical inputs:						
Fertilizers	202.2	33.2	337.0	35.4	208.0	17.5
Herbicides	15.4	2.5	14.7	1.5	16.8	1.4
Fungicides/insecticides	175.6	28.8	238.4	25.1	308.2	25.9
Total, chemical inputs	393.2	64.6	590.1	62.1	533.0	44.8
Machinery:						
Fertilization	9.2	1.5	13.1	1.4	8.8	0.7
Herbicide application	25.7	4.2	33.3	3.5	24.9	2.1
Fungicide/herbicide application	89.4	14.7	51.2	5.4	82.2	6.9
Agricultural practices	31.4	5.2	15.0	1.6	23.6	2.0
Total, machinery	155.7	25.6	112.6	11.8	139.4	11.7
Labor:						
Fertilization	1.2	0.2	2.9	0.3	2.0	0.2
Herbicide spraying	4.2	0.7	9.4	1.0	7.0	0.6
Fungicide/herbicide application	9.0	1.5	9.9	1.0	16.0	1.3
Ant/rodent control	6.4	1.0	14.7	1.5	14.7	1.2
Agricultural practices	4.0	0.7	3.4	0.4	5.0	0.4
Pruning	35.3	5.8	208.0	21.9	69.3	5.8
Orchard (cleaning/cultural)	0.0	0.0	0.0	0.0	402.1	33.8
Total, labor	59.9	9.8	248.2	26.1	516.1	43.4
Total, direct costs	608.7	100.0	951.0	100.0	1,188.6	100.0

Source: Compiled by the Commission based on data from Instituto Nacional de Tecnología Agropecuaria (INTA), Entre Ríos province, Argentina.

Note: Converted to U.S. dollars assuming the following exchange rates: 2003 ($1 = 2.45 pesos); 2004 and 2005 ($1 = 3 pesos).

Cost Considerations

Production costs have been rising in recent years for Argentine lemon and orange producers. Irrigation costs generally increased by 40 percent in 2005, as rising oil prices affected the cost of plastic used in drip irrigation systems.[81] Fertilizer costs rose by 50 percent and labor costs by threefold that year.[82] Land values have decreased in many areas as a result of the economic crisis in past years. Values in Tucumán have declined from about $12,000/ha (planted) before the crisis to about $7,000/ha currently.[83] However, the recent economic recovery and competition from nontraditional crops, mainly blueberries, have put upward pressure on land prices.[84] The price of land suitable for blueberries, which require the best soil, has risen by 40 percent during the past 2 years.[85]

Transportation costs generally have not been a major competitive disadvantage in the Argentine citrus industry. The disadvantage caused by the distance of the northwest area from the major consuming and exporting center in Buenos Aires largely have been countered by other factors that provide cost advantages, such as climate and scale of production. In

[81] USDA, FAS, *GAIN Report* No. AR5016, 6.
[82] Ibid.
[83] Interview with Argentine government officials, December 6, 2005, Tucumán, Argentina.
[84] Interview with Argentine industry representatives, December 5, 2005, Tucumán, Argentina.
[85] Ibid.

terms of export markets, cost advantages and counterseasonal production limit transportation cost issues. For example, Argentine lemon producers can compete with Spanish producers in the Russian market despite their distance disadvantage.[86] However, the distance from major markets is more limiting with respect to the ability of Argentine exporters to quickly respond to changes in market conditions.[87]

[86] Ibid.
[87] Interview with Argentine industry representatives, December 6, 2005, Tucumán, Argentina.

CHAPTER 6
Australia

Introduction

Australia is a relatively small producer and exporter of citrus; its output of oranges accounts for less than 1 percent of total global production. Nevertheless, Australia is an important global supplier of fresh-market oranges and has competitive advantages in orange quality and the capability to offer counterseasonal sales to the Northern Hemisphere.[1] Australian fresh oranges command high average world prices as the value of its exports is nearly 3 percent of the world total.[2] Australia is a very small exporter of lemons; most production is destined for the domestic market. The Australian citrus sector benefits from a favorable growing climate that allows for cultivation of oranges with good color and sweetness and low incidence of pests and diseases. The industry generally uses the latest plant science, irrigation, and fertigation technologies. Leading Australian packer/exporter companies are highly automated and cost-efficient suppliers. The citrus sector has a well developed industry support structure and benefits from relatively lower transportation costs and shorter shipping times to important Asian markets, compared with its main competitors. Major cost factors affecting the industry include expensive and scarce labor, water shortages, small scale production on most citrus farms, and relatively high average packing costs.

Industry Overview

Production Trends

Citrus is the second leading horticultural sector in Australia, after winegrapes, accounting for 15 percent of total fruit production and 1.3 percent of total agricultural production.[3] Australia's principal citrus products are oranges, mandarins, lemons and limes, and grapefruit. Orange output in 2005 was 500,000 mt, which accounted for over two-thirds of Australia citrus output by volume. By value, orange production was $218 million[4] in 2005, approximately 75-80 percent of total citrus value (table 6-1). During 2000-2005, Australian production of oranges averaged 500,000 mt; however, drought in major growing regions decreased output in certain years during the period. Australian production of lemons[5] is relatively small, estimated at $15 million in 2004.

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[1] Australia's principal Southern Hemisphere competitor is South Africa; however, Australian fresh citrus is generally regarded as higher quality, despite improving quality of South African citrus.

[2] Government of South Australia, *South Australian Fresh Citrus*, 17.

[3] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 18.

[4] All dollar values in this profile (text and tables) are in U.S. dollars, unless explicitly stated in Australia dollars.

[5] The Australian Bureau of Statistics aggregates data for lemons and limes. Industry sources estimate that lemon production accounts for approximately three-quarters of lemon/lime production.

Table 6-1 Oranges: Australian production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	510	550	451	599	395	500
Production value (1,000 US dollars)	160,727	148,263	159,210	182,662	188,505	218,481
Bearing hectarage (1,000 hectares)	27	25	24	25	22	22
Annual yield (1,000 hectare)	19	22	19	24	18	23

Sources: Australian Bureau of Statistics; FAOSTAT data (2005).

Australia principally produces Valencia and navel orange varieties. Valencias are primarily processed into juice; navels are sold mostly in the fresh market. Navel orange production was 225,000 mt in 2004, approximately one-half of total orange output. Average unit prices for navels are from 10 percent to 100 percent higher than Valencia prices in most growing regions. Plantings of navel varieties increased 10 percent during 2000-2004 as growers switched out of Valencia production to navel oranges. Output of lemons remained relatively stable during the period increasing by less than 10 percent (table 6-2). Calculated yields for Australian oranges were 23 mt/hectare (ha) in 2005, while lemon yields were 35 mt/ha. However, yields for export oriented navel orange orchards are higher, between 35-45 mt/ha.[6]

Table 6-2 Lemons and limes: Australian production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	32	36	40	34	28	35
Production value (1,000 US dollars)	13,452	13,138	19,731	18,331	21,935	23,886
Bearing hectarage (1,000 hectares)	1	1	1	1	1	1
Annual yield (1,000 hectare)	32	36	40	34	28	35

Sources: Australian Bureau of Statistics; FAOSTAT data (2005).

Growing Regions

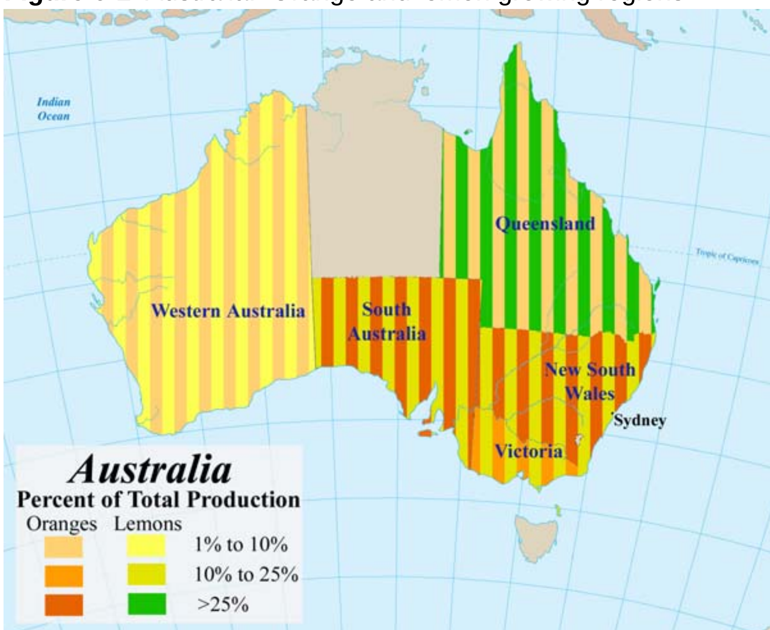
Australia's citrus production is concentrated in the irrigation areas of the country's main river basins, the Murray and Darling, and also the Murrumbidgee, Lachlan, and Campaspe rivers. Principal citrus producing areas are Riverland in South Australia, Murrumbidgee Irrigation Area (MIA) in New South Wales (NSW), and the Murray river area in southern NSW and northern Victoria. Collectively these areas are referred to as the Murray-Darling Basin. Citrus is also produced in the northeast in the Central Burnett and Emerald regions of Queensland, the leading area of Australian lemon production. Smaller amounts of citrus are produced in the coastal regions of NSW, Queensland, the Northern Territories, and in Western Australia (figure 6-1).

Orange production is concentrated in three Australian states: New South Wales, South Australia, and Victoria, which are contiguous to one another in the Murray-Darling basin, as shown in the following tabulation:

[6] Australian Citrus Growers, "The Industry."

Oranges and lemons/limes: Australian share of production by state, 2002		
State	Oranges	Lemons/limes
New South Wales	41	17
South Australia	30	23
Victoria	20	22
Queensland	5	36
Western Australia	2	2

Figure 6-1 Australia: Orange and lemon growing regions



This region is ideal for producing oranges primarily because of its dry, temperate climate, characterized by warm days and cool nights, and access to water.

Lemons are one of the most sensitive citrus fruits to frost, but are also the most tolerant to heat. Consequently, the leading lemon production area in Australia is Queensland, which is characterized by a mild subtropical climate. The leading variety produced in these climates is Eureka.[7] However, other varieties, such as Lisbon, which are less sensitive to cold and dry heat, are produced in the more temperate climate of the Murray-Darling basin.[8]

Output of Valencia oranges (212,000 mt) was larger than navel output (189,000 mt) in 2003. However, production volume of navel varieties is forecasted to exceed Valencia production when nonbearing orchards become commercially productive. Although some Valencia production is sold in the domestic fresh and export markets (particularly in Asia), most Valencia oranges are processed into single strength juice which has experienced strong demand growth during the last two decades.

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[7] Hardy, *Growing Lemons in Australia*.
[8] Ibid.

Structure and Organization

The Australian citrus industry has undergone major structural changes during the last two decades. The number of farmers decreased by nearly 10 percent, while the packing sector has undergone consolidation. The orange industry is restructuring, because of the emergence of Brazil as the dominant world supplier of low-cost frozen concentrated orange juice (FCOJ). In the past, Australia produced more FCOJ, but growers have switched to other products because of competition from Brazil. In addition, the Australian government has phased-out support for FCOJ production.

The major focus for Australian growers now is to produce high quality oranges for the domestic and international fresh markets which provide higher returns than FCOJ. Some Valencia orchards are being replanted with navel varieties, and remaining Valencia production is generally being channeled to higher-value fresh juice markets. Consequently, growers are using more sophisticated cultural practices in the orchard, including food safety management protocols, and the packing sector has upgraded its quality control procedures to meet the strict quality and food safety standards of the domestic and leading export markets.

Growers

There were an estimated 3,444 establishments growing citrus in Australia during 1999-2000.[9] The industry is relatively concentrated with the top 30 percent of growers accounting for 90 percent of production; whereas the bottom 50 percent of producers account for 2 percent of production.[10] Over two-thirds of Australian citrus growers earn income from agricultural activities other than citrus.[11]

Packing Operations

In 2001, there were approximately 144 packing facilities in Australia.[12] During 1993-2001 the Australian packing sector consolidated and the number of houses declined by 40 percent.[13] The largest fruit packing companies are highly automated operations that use barcode scanning, computerized fruit sizing, sorting, and packing equipment. These packers are primarily export-oriented and include the Mildura Fruit Company (MFC), Australia's largest processing facility that packs 2 million cartons per year, 90 percent of which is shipped for export.[14] Another leading packer, Yandilla Park,[15] packs just under 2 million cartons. Other large packers include Vitor (1.5 million cartons per year) and Simpson Packing.[16]

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[9] Commonwealth of Australia, *Citrus Growing and Processing,* 37.

[10] Ibid., XXIV. Statistics refer to 1997; however, the industry is believed to have become more concentrated in recent years.

[11] Ibid., 51.

[12] Ibid., 64.

[13] Government of South Australia, *South Australian Fresh Citrus,* 32.

[14] MFC also packs fruit for Sunkist. Information on MFC website at *www.mfc.com.au*.

[15] Information on Yandilla Park Packing Division at: *http://www.yandillapark.com.au/Growers/packing_main.htm*.

[16] Information on Simpson Packing at: *http://www.riverland.net.au/~simpak/profile.htm*.

Packing choices vary by grower based on the size of production and other factors. Smaller growers may pack their own fruit with family labor, while large growers may invest in their own packing facilities, or haul their fruit to large, regionally-based pack houses. There are packing houses owned by cooperatives as well as privately owned packing facilities.[17] The sophistication of packing houses also varies. Large packing houses tend to be more automated, using special equipment to do most of the activities such as grading and packing cartons. Smaller facilities may use mainly labor.

An important shift in producing oranges for the fresh market rather than for processing has been the increased focus on food safety and quality assurance at the packing house. Food safety is now managed from the orchard through the supply chain. The packing house is an integral component in this process. The retail sector has placed emphasis on traceabilty and food safety and is requiring packing houses to institute Hazard Analysis and Critical Control Point (HACCP) principles in the handling of fruit. HACCP procedures are not only required by large retail chains, but also by grower organizations, including certain Australian citrus boards, that require audits of HACCP-based safety programs to ensure quality and standards.[18]

Integration

The Australian citrus industry is composed of a small number of very large companies that are involved in many aspects of citrus production and distribution, and a large number of small producers. Many of these large firms, which dominate Australia's export sector, are diversified and integrated agribusinesses that produce and market a wide range of fresh and processed horticultural products. The largest companies, numbering fewer than 15, dominate Australia's fresh and processed citrus sector.[19] Australia's largest citrus companies offer competitive advantages to the sector through economies of scale, having the financial resources to invest in sophisticated cost-saving technology, and having the capacity to form strong supply chain links with global retailers. Although Australia's horticultural sector has experienced vertical integration in recent decades, there has been a recent trend of separating production and orchard management from packing and marketing.[20]

Industry Organizations

The Australian Citrus Growers (ACG), the major organization that supports the country's citrus industry, is a confederation of 30,000 members linking 9 regional growing organizations and the main statutory citrus boards.[21] These citrus boards are the Murray Valley Citrus Marketing Board, Citrus Board of South Australia, Murrumbidgee Irrigation Area Citrus Fruit Promotion Marketing Committee (Riverina Citrus), and the Queensland Fruit and Vegetable Growers.[22] The citrus boards conduct research, provide extension services, market information, and conduct promotion activities.

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[17] Commonwealth of Australia, *Citrus Growing and Processing*, 64.

[18] Ibid., 67.

[19] These firms include: ASI Teys McMahon, Yandilla Park Ltd., Tibercorp Limited, Chiquita Brands South Pacific Limited, Vitor Marketing Pty Ltd, Riversun Export Pty Ltd, Berri Ltd. For information on these companies, see: Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 36-41.

[20] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 37.

[21] Australian Citrus Growers, "What is the ACG?"

[22] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 35.

The Australian citrus industry supports research and development through Horticulture Australia Limited (HAL). Growers are subject to compulsory national levies, which are collected at the first point of sale by the packer, agent or processor. Commercial growers pay A$1.97/mt on all citrus for research and development, which is matched by the Commonwealth of Australia. In 2004-05, A$2.9 million was invested in citrus research projects managed by HAL.[23] Additional levies are assessed on oranges at A$0.75 per ton for domestic and export marketing and promotion. This levy is not matched by the Commonwealth. In 2004/2005 these levies totaled A$760,000.[24] Regional levies are also assessed on citrus. Plant Health Australia also receives funding from commercial citrus growers who are assessed A$0.03/mt.

Market Overview

Product Utilization

Australian output of oranges channeled to the fresh market (57 percent) is higher than that for processing (43 percent) and is trending upwards as navel orange production overtakes Valencia as the leading variety produced. Approximately 80 percent of navel oranges are sold in the fresh domestic and export markets. Low quality navels are processed into FCOJ. For Valencia varieties, 55 percent are processed into single-strength juice (not from concentrate), 35 percent are consumed in the fresh market, and the remainder are processed into FCOJ.[25] Lemons are predominantly produced for the fresh market.

Domestic Consumption

Australia is a net exporter of fresh oranges. Only 3 percent by volume of domestic orange consumption was supplied by imports in 2005, while over one-quarter of total orange production was exported (table 6-3). The ratio of fresh market orange imports to consumption has averaged less than 5 percent during 2000-2005. Imports mainly supply the counterseasonal period. Fresh lemons and lime consumption has been stable during 2000-2004, averaging 33,000 mt, with exports balancing imports in most years during the period (table 6-4).

Pricing and Marketing

Most oranges and lemons are sold by farmers to packers on the spot market. A lesser proportion are provided to packers on a consignment basis.[26] In recent years, large retailers are bypassing wholesalers and purchasing fruit directly from large grower/packer organizations to ensure an adequate supply of specified quality fruit.[27]

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[23] Australian Citrus Growers, "Levies."

[24] The levies were used in the domestic market by the Domestic Oranges Promotion Committee, in coordination with the ACG and the statutory citrus boards. The export programs are managed by a committee of exporters and the ACG.

[25] See Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 18.

[26] Commonwealth of Australia, *Citrus Growing and Processing*, 66.

[27] Ibid., 67.

Table 6-3 Oranges: Australian imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	510	14	137	387	4	27
2001	550	11	150	411	3	27
2002	451	8	136	323	2	30
2003	599	10	99	510	2	17
2004	395	12	103	304	4	26
2005	500	13	131	382	3	26

Source: USDA FAS PSD data; Global Trade Atlas.

Table 6-4 Lemons and limes: Australian imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	32	2	3	31	6	9
2001	36	2	4	34	6	12
2002	40	2	4	38	5	11
2003	34	3	3	34	9	9
2004	28	3	1	30	10	3
2005	35	5	1	39	13	3

Source: Australian Bureau of Statistics; Global Trade Atlas.

Table 6-5 displays wholesale market unit values for all oranges and lemons/limes during 2000-2005.[28] Orange prices increased during the period as prices for navel oranges increased substantially, especially for export markets. Lemon prices have trended upwards owing to stable demand and variable domestic production during the period.

Table 6-5 Oranges and lemons/limes: Australian wholesale prices, 2000-2005 (US dollars/kg)

Item	2000	2001	2002	2003	2004	2005
Oranges	0.31	0.36	0.49	0.53	0.78	0.68
Lemons/limes	0.41	0.26	0.35	0.36	0.43	0.43

Source: Australian Bureau of Statistics.

International Trade

Exports

Although total Australian orange production has been stable during the last decade, export value increased. The trend is being driven by exports of higher-value navel oranges, particularly to the United States. Exports of Valencia varieties declined over the period, especially to Asian markets.

[28] Farmgate unit value plus marketing costs at the wholesale level.

The United States is Australia's single leading market for fresh oranges, accounting for 20 percent (US$33 million) of total citrus exports in 2005 (table 6-6). The bulk of Australia's fresh oranges are shipped to Asian markets, which represent 4 of the country's top 5 markets. However, fresh orange exports to certain Asian markets have been declining. Two factors have influenced this trend– the recent rise in the Australian dollar relative to the U.S. dollar over the last 3 years may be restricting exports to certain price-sensitive Asian markets, and the decline in production of Valencia oranges, which have typically been preferred there.[29]

Table 6-6 Fresh oranges: Australian exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	23,188	16,941	21,768	19,206	22,184	26,535
Malaysia	29,043	39,070	31,282	17,476	20,807	21,945
Hong Kong	28,700	47,684	30,458	25,275	18,365	23,816
Singapore	14,728	17,967	14,525	10,262	10,060	10,351
Japan	6,551	6,490	8,097	8,521	6,045	9,746
Other	34,615	22,012	29,786	18,525	25,129	38,243
Total	136,825	150,164	135,916	99,265	102,590	130,636
	Value (1,000 dollars)					
United States	22,101	18,053	24,467	22,645	26,706	32,675
Malaysia	12,604	17,188	13,576	10,032	12,593	12,074
Hong Kong	18,405	25,101	15,603	14,660	11,924	13,536
Singapore	6,585	8,139	6,875	6,176	6,976	6,343
Japan	5,131	5,480	7,080	8,332	5,506	8,246
Other	13,750	11,356	15,083	12,114	17,398	23,970
Total	78,576	85,317	82,684	73,959	81,106	96,846
	Unit value (dollars per metric ton)					
United States	953	1,066	1,124	1,179	1,204	1,231
Malaysia	434	440	434	574	605	550
Hong Kong	641	526	512	580	649	568
Singapore	447	453	473	602	693	613
Japan	783	844	874	978	911	846
Other	397	516	506	654	692	627

Source: Australian Bureau of Statistics; Global Trade Atlas.

Navel oranges are Australia's leading citrus export in quantity and value. The United States is the leading market, purchasing nearly one-half of total navel exports. Until recently, this growth has been driven by the long-term trend of the depreciating Australian dollar, relative to the U.S. dollar.[30] Australian exports of citrus are primarily shipped to the West Coast markets, including California.

Export controls apply to the marketing of Australian oranges in a number of its leading markets. Exports to the U.S. market are channeled through a single importer, Riversun Export, PTY Ltd, a service company owned by packers and exporters, that coordinates fruit

[29] Government of South Australia, *South Australian Fresh Citrus*, 18.
[30] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 33.

sales on consignment to U.S. agents.[31] Export controls also apply to markets in Taiwan, Thailand and the Republic of Korea that have limited number of import licences.[32]

Total Australian exports of lemons/limes during the period declined to below $1 million, while the total volume of exports became negligible (table 6-7). The fall in value is primarily the result of exports to Japan falling to near zero, primarily owing to strong competition from lower-cost suppliers, South Africa and Chile.

Table 6-7 Fresh lemons/limes: Australian exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	461	0	46	34	221	20
Hong Kong	926	701	1,023	598	370	107
Singapore	441	399	313	350	130	62
Japan	1,035	2,141	2,161	1,305	156	10
Other	477	362	402	339	222	541
Total	3,340	3,603	3,945	2,626	1,099	740
	Value (1,000 dollars)					
United States	387	0	52	39	247	20
Hong Kong	548	360	557	345	237	76
Singapore	230	224	290	392	175	93
Japan	1,027	1,942	2,147	1,398	141	8
Other	280	172	204	261	157	319
Total	2,504	2,729	3,282	2,486	983	605
	Unit value (dollars per metric ton)					
United States	839	([a])	1,130	1,147	1,118	1,000
Hong Kong	592	514	544	577	641	710
Singapore	522	561	927	1,120	1,346	1,500
Japan	992	907	994	1,071	904	800
Other	587	475	507	770	707	590

Source: Australian Bureau of Statistics; Global Trade Atlas.

Australian citrus exports face relatively low duties in most of its leading export markets. Under the U.S.-Australia FTA, Australian citrus products enter the United States free of duty. Oranges also enter Malaysia, Hong Kong, Singapore without tariffs. Duties in Japan range from 16-37 percent ad valorem depending on the season.[33]

Imports

Imports of fresh citrus enter Australia free of duty.[34] Australian citrus imports primarily supply counterseasonal demand. The United States supplied over 90 percent of Australia's fresh orange ($11 million) and lemon ($5 million) imports in 2005 (tables 6-8 and 6-9).

Imports of all fresh horticultural products into Australia are subject to strict sanitary and phytosanitary requirements. The Australian Quarantine and Inspection Service (AQIS) is responsible for monitoring imported agricultural products and maintains a database on

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[31] Information on Riversun Export Pty Ltd. at: *www.riversun.com.au.*
[32] Commonwealth of Australia, *Citrus Growing and Processing*, XXXI.
[33] APEC tariff database.
[34] Imports of processed citrus are subject to a 5 percent ad valorem duty.

Table 6-8 Fresh oranges: Australian imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	11,292	9,540	7,225	8,724	11,892	12,196
Egypt	0	0	0	431	185	356
Spain	2,495	1,473	957	521	171	41
Other	34	54	13	68	73	25
Total	13,821	11,067	8,195	9,744	12,321	12,618
	Value (1,000 dollars)					
United States	8,060	7,762	7,492	7,029	9,699	11,181
Egypt	0	0	0	204	83	186
Spain	1,912	1,150	893	489	187	91
Other	32	19	9	47	62	28
Total	10,004	8,930	8,386	7,769	10,032	11,485
	Unit value (dollars per metric ton)					
United States	714	814	1,037	806	816	917
Egypt	([a])	([a])	([a])	473	449	522
Spain	766	781	933	939	1,094	2,220
Other	941	352	692	691	849	1,120

Source: Global Trade Atlas.

[a]Data not available.

Table 6-9 Fresh lemons/limes: Australian imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	1,743	1,437	1,998	2,772	2,982	4,474
New Zealand	96	384	135	244	84	138
Spain	238	466	199	210	224	29
Other	2	1	3	10	31	5
Total	2,079	2,288	2,335	3,236	3,321	4,646
	Value (1,000 dollars)					
United States	1,840	1,921	2,928	3,965	4,211	5,464
New Zealand	110	313	149	234	95	133
EU-25	201	351	201	200	255	42
Other	2	6	12	8	24	12
Total	2,155	2,591	3,290	4,407	4,586	5,649
	Unit value (dollars per metric ton)					
United States	1,056	1,337	1,465	1,430	1,412	1,221
New Zealand	1,146	815	1,104	959	1,131	964
EU-25	845	753	1,010	952	1,138	1,448
Other	1,000	6,000	4,000	800	774	2,400

Source: Global Trade Atlas.

procedures and certification requirements necessary for imports. Similar to other importers of fresh citrus, Australia maintains different plant safety and food health requirements depending on the supplier country.[35]

[35] AQIS, Phyto Search database.

Competitive Factors

The Australian orange industry produces fruit of bright color, sweetness, and a range of preferred sizes.[36] Australia's principal citrus growing region has a dry Mediterranean climate, which limits the incidence of fungal disease and pests. The significant temperature variation between warm days and cool nights makes the region exceptional for producing high quality navels. Australia uses sophisticated technology in the orchard including the latest irrigation, fertigation, and plant science technology. Australia possesses a well diversified mix of orange varieties that extend its fresh marketing season for 9 months. The Australian industry also benefits from a well developed industry support structure. In the postharvest sector, the industry generally has high packout rates.[37] The packing sector has also benefited from consolidation, which has lowered average packing costs.

Industry weaknesses include a large number of relatively small-scale farms, 20 ha or less, which limits the cost savings of economies of scale. Moreover, although Australia has some large-scale and technologically sophisticated packing facilities, smaller facilities have higher packing costs than other large fresh orange exporting countries, such as the United States and South Africa.[38] Other weaknesses are relatively expensive and scarce labor and limited water resources.

Natural Endowments

Over 80 percent of Australia's citrus is produced in the Murray-Darling basin, which has a temperate Mediterranean climate similar to the citrus-growing regions in California. Owing to the relatively dry conditions, most citrus orchards are supplied with water through irrigation systems. The dry climate is also an important factor in the low incidence of disease and pests. However, Australia is prone to periods of drought. During 2000-2003, drought substantially reduced citrus production, but even under normal conditions, limited water resources and water quality issues such as high salinity[39] are major issues for the industry. It has been noted that in certain areas of the Murray-Darling Basin, the lack of water is a limiting factor in the development of new citrus plantations.[40]

Australian citrus orchards are located in two main climatic zones–a temperate climate in the Murray-Darling basin, and sub-tropical and tropical climates in Queensland and the coastal regions. Within these broad zones, there is variability in microclimates, with differences in temperature, topography, soil pH, and rainfall. For example, in Australia's leading citrus-producing state, New South Wales, rainfall amounts differ widely in its principal growing areas. In Riverina, average annual rainfall is 400 mm; in the Murray Valley, 273 mm; and the coastal areas, 1,200 mm.[41]

Australian citrus orchards are planted mainly in deep sandy soils that provide good drainage.[42] However, most orchards are planted on marginal soils that are not ideal for citrus, because of less than optimum soil pH. Therefore, managing soil conditions, through orchard

[36] Government of South Australia, *South Australian Fresh Citrus*, 9.
[37] The packout rate is the percentage of harvested fruit that is packed for distribution.
[38] Commonwealth of Australia, *Citrus Growing and Processing*, 68.
[39] ABARE, "Land and Water."
[40] Skewes and Meissner, "Irrigation Efficiency, What it is and Can we Improve it?"
[41] NSW Department of Primary Industries/Agriculture, "How to Manage Soil for Citrus."
[42] Atlas South Australia, "Soils."

management techniques including irrigation, fertigation, and the selection of subvarities and rootstock are essential to producing citrus in Australia.[43]

Water Issues

Irrigation is the primary water source for Australian citrus groves. Irrigation methods in Australia have changed in recent years owing to increased environmental awareness and strict specifications regarding chemical residues in Australia's domestic and export markets. For example in Riverland, open irrigation channels are being replaced with sealed pipes, flood and overhead irrigation systems have been replaced with under-tree systems, and drip irrigation has largely replaced under-tree sprinklers.[44]

Water used in agricultural production is relatively expensive. In the southern Murray-Darling basin, fixed and variable water fees ranged from $21/megalitre (1 million liters) to over $74/megalitre.[45] The average cost of water purchased on a temporary (annual) basis was $91/megaliter.[46]

Water Policy

Because of the scarcity of water, the Australian Government, working with the states and territories, established markets for trading water rights among the country's agricultural users. Under this program, the Australia National Water Initiative, caps have been placed on total water usage within a state and a water trading system was set up to increase the efficiency of agricultural water consumption.

Under the water trading policy, agricultural production is expected to shift away from less efficient users, such as the cotton industry, to more efficient and profitable users, including the citrus industry which has one of the highest returns per unit of water used. The system is also effectively delinking water rights to property, which allows agricultural sectors that get the highest returns from the use of water to be able to purchase the rights from less productive users.[47] Trade in water has risen dramatically since state governments established the trading systems in the late 1980s and early 1990s.[48] There is now a program for interstate water trading that is expected that allow increased trade in water rights among users in the 3 contiguous states in the Murray-Darling basin.[49] This system is expected to allow citrus production to expand, even in the presence of water limitations.

Irrigation

Australian citrus production is heavily reliant on irrigation technology for its water supply. Allowing for evaporation and leaching, mature citrus trees require about 1,150 mm of water annually.[50] This is well above the annual rainfall during the growing season in the major

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[43] NSW Department of Primary Industries/Agriculture, "How to Manage Soil for Citrus."
[44] Government of South Australia, *South Australian Fresh Citrus*, 35.
[45] ABARE, "Water charges and interregional trading," 7. Converted to U.S. dollars.
[46] Horticulture Australia, "Guide to Water Trading for Horticulture."
[47] Ibid.
[48] For a discussion of Australian water trading policy, see OzH2o, "Water Resources and Use in Australia."
[49] OzH2o, "Australia: Water Trading and Prices."
[50] Murray Valley Citrus Board, *Citrus in the Murray Valley.*

growing regions which average under 500 mm annually,[51] except in certain coastal regions and Queensland. The level of irrigation technology used varies depending on the age, size, tree density, and soil characteristics (including salinity content) of the orchard.

Irrigation methods used by Australian citrus growers include overhead sprinklers, and under-tree systems, such as microprinklers, microjets, flood, and drip systems.[52] Controlled irrigation systems allow for fertigation, an efficient and relatively nonintrusive method of providing fertilizer and nutrients directly to the root system through irrigation lines. In the Murray Valley, for example, 85 percent of the orchards are irrigated using different types of sprinkler and drip systems, while only 15 percent are irrigated using traditional, and relatively inefficient, furrow systems that channel water among orchard rows.[53]

Irrigation technology used in the Australian citrus industry is changing as farmers are upgrading irrigation systems from flood and furrow systems to more efficient controlled systems.[54] Newer plantations are generally using the latest irrigation technology, including drip and microsprinkler technologies. The initial capital cost for such systems was estimated at A$6,500/ha ($3,696) in 2002.[55]

Pests and Diseases

Pest and diseases affecting citrus can vary by area and weather conditions.[56] Moreover, different pests can afflict different citrus products. Disease and pests are not major factors for the Australian citrus industry, as over 80 percent of Australia's citrus production is located in the relatively dry Murray-Darling River basin. In the coastal and Northern areas of Australia, which have higher levels of rain and humidity, citrus orchards are more prone to fungal diseases and certain pests. Australian lemons, for example, are more susceptible to fungal diseases than oranges because they are grown in more humid climates.[57]

The Australia Citrus Growers association provides monthly pest reports for the major citrus growing regions in Australia.[58] In the Murray-Darling basin Sunraysia, Riverina, and Riverland, pests that are monitored by the citrus growers and plant health authorities include light brown apple moths (LBAM), red and soft scale, spined citrus bugs, katydids, apphids, leaf minors, Fuller's rose weevils (FRW), mealybugs, and thrips, including Kelly's Citrus Thrip.

The fruit fly is not present in the main citrus growing region in the Murray-Darling basin, which is certified by the Commonwealth plant health authorities as a "Fruit Fly Exclusion Zone."[59] This certification is an important factor in gaining access to the United States and

[51] NSW Department of Primary Industries/Agriculture, "How to Manage Soil for Citrus."

[52] Commonwealth of Australia, *Citrus Growing and Processing*, 97.

[53] Murray Valley Citrus Board, *Citrus in the Murray Valley*.

[54] Australia Bureau of Statistics, "Water Use on Australian Farms, 2002-03."

[55] Estimated cost of microspray irrigation system in the MIA and Sunraysia regions of New South Wales. Commonwealth of Australia, *Citrus Growing and Processing*, 234.

[56] SARDI, "Citrus Diseases."

[57] Hardy, *Growing Lemons in Australia*.

[58] Australia Citrus Growers, "Season Update."

[59] Established in 1995, by agreement of the 3 main horticulture producing states in the Murray-Darling basin, NSW, South Australian, and Victoria, the Government of Australia, and the horticulture sector.

other markets.[60] Strict regulations including a quarantine on fruit from Queensland where the fruit fly is present, and other external sources, are enforced to maintain this status.

Although Australia is relatively free of disease, a major citrus disease, canker, was discovered in an orchard in the Emerald region of Queensland in July 2004. The outbreak has harmed the regions' citrus industry. A quarantine was established around the area and a program of monitoring and eradication of infected trees has been established to contain the spread and eradicate the disease.[61] The government authorities and citrus industry have taken steps to ensure that canker remains contained, and thus far canker has not spread to the main citrus growing regions.

Pests can affect fruit quality, but the presence of certain pests may also result in the fruit being banned in certain export markets or require application of agrochemicals in the orchard and/or fumigation and cold treatment of harvested fruit, which can lower its quality and shelf life. The application of agrochemicals must be handled carefully because of maximum residue level (MRL) requirements in Australia and its export markets. Maximum allowable residue levels of insecticides, fungicides, herbicides, and other agrochemicals vary by export destination and are listed on the Australian Citrus Growers' website.[62]

Seasonality

A major strength for the Australian citrus producing industry is its ability to supply fresh oranges, particularly navels, to Northern Hemisphere markets during its off-season. The only other world producer that competes with Australia during this period is South Africa. Other Southern hemisphere orange producers do not produce fresh-market oranges of high quality during this counterseasonal period.

Australia produces a diversified mix of navel oranges that extend the marketing season throughout the counterseasonal period in the Northern Hemisphere. There are four main commercial varieties of navel oranges planted in Australia: Navelina, Washington, Leng, and Lane Late. All are produced for the fresh market. The timing of fruit maturity for these varieties allows the Australian industry to supply fresh oranges throughout the marketing season, April through December as shown in the following tabulation:

Oranges and lemons: Australian marketing seasons by variety

Variety	Marketing season
Navels:	
Navelina	April-July
Washington	May-August
Leng	May-June
Lane Late	July-November
Lemons:	
Eureka	June-November
Lisbon	June-October
Meyer	March-October

[60] For more information, see Government of South Australia, "PIRSA Biosecurity and Standards."
[61] USDA, FAS, *GAIN Report* No. AS4041, 12.
[62] Australian Citrus Growers, "Citrus-Export MRLs."

Certain varieties, such as Navelina, are relatively new varieties which have been planted to take advantage of critical early-season markets when prices are generally high in the domestic and export markets. Similarly, late navel varieties, including Lane Late, are planted to take advantage of strong late-market prices. As many as 15 other navel varieties are planted in Australia, including experimental varieties that have different characteristics based on internal and external quality, marketing season, field performance, and sensitivity to pests and disease.[63]

Labor

Labor is generally regarded as a competitive disadvantage for the Australia citrus industry because it is relatively expensive and in short supply. Australian labor rates are significantly higher than its main Southern Hemisphere competitor, South Africa. Moreover there is a shortage of skilled orchard labor. The citrus packing industry is also affected by high labor costs and a shortage of personnel.

Labor is the largest proportional input cost for Australian citrus. Major factors determining labor costs are wage rates that are influenced by the overall level of the economy and government policies such as rules on immigration, workers compensation, and superannuation payments (equivalent of U.S. social security). As much of the need for labor in the citrus sector is seasonal, particularly during harvest and pruning periods, this creates additional challenges for the industry that must compete with other sectors of the economy that offer year-round employment.[64]

Land

Although Australia has an enormous land area, the continent is mostly arid, and citrus can only be produced in relatively limited regions with access to water. Farmland is deeded with water entitlements (that are titled with property). Because of a relative scarcity of land with water, land prices have been rising. However, rising land values may not only be a function of higher returns on citrus production, but may also be the result of the farmland being used for alternative agricultural production such as winegrape growing, which has experienced strong profitability during the last decade, and increasing demand for land as a result of urbanization.[65]

In certain regions of the Murray-Darling basin, the price of citrus farmland increased between 20-30 percent during 1996-2001, with land values in these regions averaging between A$8,000/ha to A$27,000/ha.[66] Increases in land values of 5 percent per year between 1995-96 and 2000-01 were also reported in the surveys of citrus farms in the Murray Valley. Property values in the lemon- growing regions of Queensland also have been increasing.[67]

[63] For more information, see Australian Citrus Growers, “Varieties and Rootstocks.”
[64] Commonwealth of Australia, *Citrus Growing and Processing*, 189.
[65] Ibid., 55.
[66] Ibid.
[67] Ibid., XXVI.

Yields

Australian orange and lemon yields depend on variety, cultural practices, climatic conditions, and rootstocks. Orange yields per tree average between 60-140 kg in major growing regions.[68] Valencia yields are significantly higher (140 kg/tree) than average yields for navels (60 kg/tree).[69] Lemon yields are generally much higher than orange yields, averaging 200 kg per tree.[70]

Cultural Practices

The cultural practices used by Australian orange and lemon growers vary according to numerous factors, including age of orchards, scale of operations, varieties planted, domestic or export market destinations, climatic and soil conditions, and other factors. Generally, the highest, most expensive levels of cultural practices are applied to orchards whose products are destined for export markets.[71] Most Australian citrus growers use integrated pest management (IPM) procedures to ensure that its fruit is free of pests and disease in the domestic and export markets.

IPM cultural practices are viewed by Australian growers as a key strategy to produce high quality fruit with high packout rates. The level of orchard management can mean the difference between generating packout rates of 35 percent for below-average practices to 75 percent for best-practices.[72] Orchard management practices are focused not only on producing quality fruit in term of size, color, and sweetness, but also focus on food safety, as required by the domestic plant health authorities and their counterparts in Australia's export markets.

Production Technology

The level of technology used by the Australian citrus industry in the orchard and by the packing industry varies, depending on the age, scale, and orientation of the operations. In the orchard, higher levels of technology are used in newer plantations. Most new orchards use efficient, yet costly, irrigation and fertigation technology controlled by computer technology that measures and manages orchard conditions. Packing house technology is also variable. The level of capital intensity is strongly correlated with the scale and focus of the operation. The largest packing houses have the most technologically advanced cleaning, sorting, and packing equipment; however, many Australian packing houses are still labor-intensive operations.[73]

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[68] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 20. 2000/2001 marketing season.

[69] Murray Valley Citrus board, "Citrus."

[70] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 20. 2000/2001 marketing season.

[71] This includes integrated pest management techniques that require audits from packers and in some cases retailers.

[72] Government of South Australia and Rural Solutions SA, *South Australian Citrus Industry*, 20. 2000/2001 marketing season.

[73] Commonwealth of Australia, *Citrus Growing and Processing*, 65.

Government Policy and Support

There is no direct government support in the form of direct payments, price support, or high tariff protection for the Australian citrus industry.[74] The Government of Australia supports the citrus industry through matching levies for citrus research and development. State governments also provide some technical assistance through extension services.

Regulatory Compliance

The Australian citrus industry is subject to various levels of regulation regarding food safety and plant heath. Many large packer/exporters maintain orchard management protocols that require best-practices in the application of agrochemicals. The Commonwealth also regulates food safety through Food Standards Australia and New Zealand,[75] which maintain maximum residue levels of agrochemicals on fruit.[76] For traded citrus products, AQIS monitors Australian citrus orchards, packing houses, treatment facilities, and packed fruit for pests, disease, and residues. Each of Australia's export markets maintain phytosanitary standards and other requirements governing imports of fresh citrus. The inspection and treatment programs for Australian citrus exports are established through protocols jointly negotiated and administered through the Government of Australia and the importing country. AQIS maintains a searchable database on sanitary and phytosanitary regulations in export markets for Australian agricultural products.[77]

Australian exports of citrus products to the United States are regulated by protocols negotiated between the USDA, APHIS, and AQIS. Fresh oranges and lemons can only be exported to the United States from the Riverland, Sunraysia, Riverina and the MIA districts. All farms, packing plants, and treatment facilities are registered with APHIS. All fruit must have documentation that it was produced in areas that are free of fruit fly.[78] Other phytosanitary regulations require that shipments are free of LBAM. In some cases, orange shipments to the United States are subject to in-transit cold treatment.[79] Currently, exports of citrus from the canker-affected region in Queensland are banned in the U.S. market. Likewise, because of citrus canker outbreak in Florida, citrus products from that state cannot be exported to Australia.[80]

Australia completed a citrus trade protocol with China in 2005. The protocol establishes certification and joint inspection requirements for Australian growers, packhouses and treatment facilities. The protocol requires certification that Australian orchards have IPM plans to ensure that its fruit is free of 8 specified pests.[81] In-transit cold treatment is required

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[74] Prior to the early- to mid-1990s, the Commonwealth of Australia provided assistance to the FCOJ growing sector in the form of high tariffs, dumping duties, and tax concessions. However, when the government of Australia recognized that its FCOJ production was not competitive, government support for the FCOJ sector was phased out in the early 1990s. Adjustment assistance was provided to assist growers to transition into the fresh oranges and fresh juice market sectors. The assistance was part of the 5-year program, the Citrus Market Development Program (CMDP) established in 1994 that set a phased reduction of protective tariffs on frozen concentrated orange juice from 35 percent in 1988 to five percent in 1996/97.

[75] A bi-national independent statutory authority that develops food standards.

[76] See Food Safety Australia New Zealand website at: *www.foodstandards.gov.au*.

[77] AQIS, Phyto Search database.

[78] AQIS, "Industry Advice Notice no. 2003/10."

[79] AQIS, "General restrictions and prohibition on exporting citrus to the United States."

[80] There are currently negotiations regarding Florida citrus exports to Australia. AQIS, "Citrus from Florida."

[81] AQIS, "Industry Advice Notice 2005/38."

for Australian export of citrus to China.[82] Diseases that are specifically regulated by the protocol include, Septoria and Phytophthora.[83]

Exports to Japan require inspection and in-tranist cold treatment, although cold treatment for fruit flies is not required for exports from certified packhouses in Riverland.[84] Korea SPS requirements require orchard inspection and in cases where certain pests including FRW are found, the fruit must be fumigated with methyl bromide.[85]

Business Climate and Investment

Australia is a free market economy; capital is available at market rates to all sectors of the Australian citrus industry. There are no significant restrictions to foreign investment regarding farmland.[86] Foreign investment is permitted in Australia including the purchase of farmland used in a "commercial primary production business," including citrus production.[87] Under the U.S.-Australia Free Trade Agreement, U.S. investment of up to $800 million is allowed in all nonsensitive sectors, without Australian governmental review.[88]

Costs of Production

Orange and lemon production costs presented in this section are from enterprise cash flow budget data.[89] Orange sample costs are for three producing regions and were compiled for the Australian Government's Productivity Commission investigation in 2002. Data representing navel orange growing operations in New South Wales (NSW), including the Murrumbidgee Irrigation Area (MIA) and Sunraysia, were submitted by the NSW Department of Primary Industries, NSW Agriculture.[90] Budget data for navel and Valencia orange production in South Australia were submitted by Citrus Growers of South Australia.[91] Packing cost data for oranges are from Retailworks[92] and are included in the Australian Government Productivity Commission report. Lemon sample costs for the Central Coast area in NSW were compiled by NSW Agriculture in 2003. For all sample data, costs were provided on a per-hectare basis and farm size was not specified.

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[82] USDA, FAS, *GAIN Report* No. AS4041, 6.

[83] Falivene, "China Export Quarantine IPM Guide."

[84] AQIS, "Industry Advice Notice 2005/15."

[85] AQIS, "Industry Advice Notice 2005/08."

[86] The current Australian law governing foreign investment are contained in the *Foreign Acquisitions and Takeover Regulations, 1989*. Australian Government, Department of the Attorney General.

[87] Foreign investments of over A$50 million ($37 million) are required to be reviewed by the Foreign Investment Review Board (FIRB), an independent board that advises the Government of Australia on Foreign investment. Unless deemed contrary to the national interest, those investments over this amount are usually approved by the review agency. Australian Foreign Investment Board, "Real Estate."

[88] Allens Arthur Robinson, "Legislative Implementation;" Allens Arthur Robinson, "Australian-United States Free Trade Agreement."

[89] These budgets are intended as guidelines for projecting/comparing costs and returns and do not "[account for] changes in crop prices, seasonal characteristics, and individual farm characteristics," which can significantly alter costs. See: Commonwealth of Australia, *Citrus Growing and Processing,* 233.

[90] Draft cash flow budgets over 21 year investment period. The excerpted budgets are for the 9th year after plantation when the orchard is at full commercial capacity.

[91] Reported costs are not specified by size of the operation. The data are assumed to be for farms using good agricultural practices.

[92] Retailworks is a consulting company that was contracted by the Commonwealth of Australia's to provide information on the citrus supply chain.

Total Costs

Sample farm-level variable production costs for navel oranges ranged from $3,730-$3,880/ha in Sunraysia and MIA growing regions, respectively (table 6-10). Fixed costs are estimated to be 18 percent of total costs; these costs apply to larger farms that can take advantage of economies of scale.[93] Fixed cost presented in the tables cover overhead and depreciation, but do not include land. Total farm costs including fixed and variable costs translate to about $130/mt. Navel and Valencia variable orange production costs in South Australia were lower at about $2,800/ha ($68/mt) including fixed and variable costs (table 6-11). Average packing costs for oranges are reported at $268/mt.[94] Carton and other materials costs can account for as much as 25 percent of packing costs, and other costs including labor, equipment, and overhead represent about three-quarters of the total packing cost for oranges.

Sample farm-level variable production costs for lemons were $2,585/ha (table 6-10). The costs represent direct farmer costs and contract harvesting. Fixed costs are estimated at 18 percent. Total fixed and variable farm costs are estimated at $126/mt.

Major Cost Components

Labor is the largest farm-level cost component (approximately 40-45 percent) in Australian citrus production,[95] followed by overhead and depreciation, which varies between 18 and 32 percent of total costs.[96] Labor costs are estimated from the available cost data at $1,870-$1,970/ha based on costs reported for pruning and harvesting. For larger operations, fixed costs represent a smaller share of total costs, suggesting that larger operations benefit from economies of scale. In the sample orange data, labor expenses (pruning and harvesting) accounted for 52 percent of total variable costs in NSW and 56 percent in South Australia. Labor costs for lemons also are a substantial share of production costs.

Packing costs are likely a significant cost component. Costs for packing oranges into cartons totaled $268/mt for both export and domestic markets (1997-1998 data). Carton costs were higher for export markets; $66/mt compared to $55/mt for cartons used in the domestic market. Although packing costs are not specifically available for lemons, they are believed to be similar.

Orchard establishment costs in New South Wales' MIA and Sunraysia regions totaled over $8,000/ha in 2002.[97] The cost of installing micro jet irrigation systems was the largest expenditure, $3,530/ha (44 percent) followed closely by planting ($3,151/ha) for setting up navel and Valencia orchards. Orange orchard establishment costs in South Australia were lower; excluding land preparation expenditures, they totaled $2,122/ha in 2002.[98]

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[93] Government of South Australia, *South Australian Fresh Citrus*, 28.
[94] Commonwealth of Australia, *Citrus Growing and Processing*, 228. 1997-1998 reported costs.
[95] The cost share of labor is estimated by combining pruning costs with contract harvest costs.
[96] Government of South Australia, *South Australian Fresh Citrus,* 28.
[97] Commonwealth of Australia, *Citrus Growing and Processing*, 234-235.
[98] Ibid., 240-241.

Table 6-10 Navel oranges and lemons: Production costs and cost shares in New South Wales

Cost component	MIA Navels		Sunraysia Navels		NSW Lemons	
	Value	Cost share	Value	Cost share	Value	Cost share
Farm-level costs:[a,b]						
Per-hectare variable costs, (dollars/ha):						
Irrigation	317	8	317	8	8	([c])
Herbicide	70	2	61	2	85	3
Fertilizer	223	6	298	8	205	8
Fungicides	2	([c])	2	([c])	([d])	([d])
Insecticides	141	4	124	3	97	4
Crop management sprays	265	7	206	6	([d])	([d])
Pruning	750	20	750	20	534	21
Crop Management	157	4	157	4	([d])	([d])
Tractor	456	12	456	12	433	17
Contract harvesting	1,216	32	1,216	33	1,105	43
Harvesting levies	109	3	139	4	53	2
Hauling (cartage)	67	2	([d])	([d])	65	3
Total, farm cost	3,773	100	3,726	100	2,585	100
Per-unit costs, (dollars/mt[e]):						
Variable cost	108	82	106	82	103	82
Fixed costs	24	18	23	18	23	18
Total, farm costs	132	100	129	100	126	100
Packing costs, (dollars/mt[f])						
Materials costs/cartons	51-66	19-25	51-66	19-25	([d])	([d])
Other costs	202-217	75-81	202-217	75-81	([d])	([d])
Total, packing costs	268	100	268	100	([d])	([d])

Sources: Commonwealth of Australia, *Citrus Growing and Processing*, 228, 234-235; Hardy, *Growing Lemons in Australia*, 18-3.

[a]Costs for oranges in 2002 converted to U.S. dollars assuming a real exchange rate of $1 = A$1.76. Assumes tree density of 550 trees per hectare in 9th year after plantation (full production of 35 mt/ha). Orange packing cost data in 1997-1998 converted to U.S. dollars assuming a real exchange rate (2000 prices) of $1 = A$1.34.

[b]Costs for lemons in 2003 converted to U.S. dollars assuming a real exchange rate (2000 prices) of $1 = A$1.54. Assumes tree density of 250 trees per hectare (production of 25mt/ha).

[c]Less than 0.5 percent.

[d]Not available or figure included in other costs.

[e]Assumes farm-level fixed costs of 12 percent of total production expenditures. Government of South Australia, *South Australian Fresh Citrus,* 28.

[f]Packing costs in 1997-98. Carton price range varies according to whether exported or for domestic market. Bag prices for domestic market. Commonwealth of Australia, *Citrus Growing and Processing*, 228.

Table 6-11 Navel and Valencia oranges: Average production costs and cost shares in South Australia

Cost component	Navels		Valencias	
	Value	Cost share	Value	Cost share
Farm-level costs:[a] (dollars/ha)				
Pruning	216	8	216	8
Fertilizer/spread/cover crop	286	10	286	10
Water and power	269	10	269	10
Herbicides/sprays	75	3	75	3
Pest and disease sprays	237	8	237	8
Picking	1,352	48	1,352	48
Freight	351	13	351	13
Total, farm costs	2,794	100	2,794	100
Per-unit costs:[b] (dollars/mt)				
Variable cost	56	82	56	82
Fixed costs	12	18	12	18
Total costs	68	100	68	100

Source: Commonwealth of Australia, *Citrus Growing and Processing*, 240-241.

[a]Costs in 2002 converted to U.S. dollars assuming a real exchange rate of $1 = A$1.76. Assumes tree density of 408 trees per hectare in 9th year after plantation (full production of 50 mt/ha).

[b]Assumes farm-level fixed costs of 18 percent of total production expenditures. Based on information from Government of South Australia, *South Australian Fresh Citrus*.

CHAPTER 7
Chile

Introduction

Although Chile is a major global producer and exporter of fruit, its role in the international citrus market is relatively minor. Chile accounts for a small share of global orange and lemon production and exports, ranking well below the top ten producers of oranges and near the top ten producers of lemons.[1] Although the Chilean citrus sector historically has been small, it has been growing in recent years as citrus production follows the Chilean model of developing new fruit industries in response to global market demand, as demonstrated by the substantial growth in the production and export of products such as apples, peaches and nectarines, kiwi fruit, avocados, and table grapes. Chilean producers and exporters of fruit, including citrus, benefit from strong ties with each other and with large distributors in major export markets, as well as from state-of-the-art production methods and export infrastructure.[2] Other strengths include a relatively low incidence of pests and diseases and a season that is counter to that of Northern Hemisphere markets. Chile's main competitive weakness is its distance from these markets.

Industry Overview

Chilean production of oranges and lemons increased substantially during 2000-2005 (tables 7-1 and 7-2). Lemons are the primary citrus fruit in Chile, closely followed by oranges.[3] Mandarins, mainly clementines, account for a small but growing share of the Chilean citrus sector. A minor amount of other citrus, mainly grapefruit and tangelos, is also grown. Citrus in Chile generally is grown in conjunction with other fruits, such as avocados and grapes. This enables producers to diversify products, extend the period of production, and retain skilled labor throughout the year.[4] Although the bulk of output is marketed domestically, the Chilean orange and lemon industries have become increasingly focused on export markets. As a result, the industry has adopted the latest technology and cultural practices to maximize yields of export-quality fruit.

Production Trends

Chilean orange production increased 44 percent in quantity during 2000-2005, reaching 140,000 mt in 2005 (table 7-1). Lemon production rose 31 percent to 165,000 mt during the period (table 7-2). The growth in the production of oranges and lemons resulted, in large part, from newer trees in orchards reaching commercial bearing levels, effectively increasing yields.[5] Total bearing hectarage was relatively stable during the period. Lemon production is expected to continue to increase, as many trees have yet to reach their peak production

[1] FAOSTAT (2005). Data for lemons include limes.
[2] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.
[3] ODEPA, CIREN, *Catastro Frutícola*.
[4] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.
[5] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.

Table 7-1 Oranges: Chilean production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	97	101	114	120	125	140
Production value (1,000 US dollars)	([a])	([a])	([a])	([a])	([a])	([a])
Bearing hectarage (1,000 hectares)	8	8	8	8	8	8
Nonbearing hectarage (1,000 hectares)	([a])	([a])	([a])	([a])	([a])	([a])
Total hectarage (1,000 hectares)	8	8	8	8	8	8
Annual yield (mt/hectare)	13	13	15	16	16	18

Source: ODEPA, FAOSTAT.

[a]Data not available.

Table 7-2 Lemons: Chilean production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	126	132	140	150	160	165
Production value (1,000 US dollars)	([a])	([a])	([a])	([a])	([a])	([a])
Bearing hectarage (1,000 hectares)	8	8	7	7	7	7
Nonbearing hectarage (1,000 hectares)	([a])	([a])	([a])	([a])	([a])	([a])
Total hectarage (1,000 hectares)	8	8	7	7	7	7
Annual yield (mt/hectare)	17	17	21	22	23	23

Source: ODEPA, FAOSTAT.

[a]Data not available.

stage.[6] The development and expansion of export markets also contributed to the rise in production during the period, as producers increased yields using cultural practices to conform with requirements in export markets.[7] Most new plantings are focused on export markets.

The principal type of orange grown in Chile is the navel –including the Thompson, Washington, and Newhall varieties –as shown in the following tabulation:

Oranges: Chilean production by variety (percent)

Variety	Share of planted area
Thompson	29
Valencia Late	21
Washington Navel	12
Newhall	11
Lane Late	7
Chilena	4
Others	16
Total	100

Source: Allamand and Ossa, "Analysis del presente y futuro de la citricultura Chilena."

Navels have become the main type of orange produced, as the Chilean industry is increasingly oriented to the export market.[8] New orange plantings of navels for export are

[6] Interview with Chilean industry representatives, December 13, 2005, Quillota, Chile.
[7] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.
[8] However, only about 14 percent of total orange production was exported in 2005. Interview with Chilean industry representatives, December 13, 2005, Quillota, Chile.

mainly of early and mid-season varieties.[9] Principal lemon varieties include Genoa, Eureka, and Fino.[10] New lemon plantings are also focused on early varieties, mainly Fino and Messina, that enable growers to take advantage of seasonal windows in major export markets.[11]

Growing Regions

Orange and lemon production generally is located in the middle portion of Chile, in the region surrounding the capital, Santiago (figure 7-1). Principal Chilean orange growing areas include region V through region VI, including the Metropolitan Region (RM), and are concentrated in region VI, as shown in the following tabulation:

Oranges: Chilean planted area, by region (hectares)

Region and survey year	Area
Region III (2005)	108
Region IV (2005)	618
Region V (2002)	1,219
RM (Metropolitan) (2004)	2,263
Region VI (2003)	3,996
Region VII (2001)	20
Region VIII (2000)	2

Source: ODEPA, Ciren, *Catastro Frutícola*, various regions.

Lemon production areas mainly are located in the RM and surrounding regions, as shown in the following tabulation:

Lemons: Chilean planted area, by region (hectares)

Region and survey year	Area
Region III (2005)	123
Region IV (2005)	1,241
Region V (2002)	1,704
RM (Metropolitan) (2004)	3,117
Region VI (2003)	972
Region VII (2001)	73
Region VIII (2000)	9
Total	7,239

Source: ODEPA, Ciren, *Catastro Frutícola*, various regions.

The regional distribution of production volumes generally correspond with that of growing areas, as shown in the following tabulation:

[9] Interview with Chilean industry representatives, December 13, 2005, Quillota, Chile.
[10] ODEPA, CIREN, *Catastro Frutícola*.
[11] Interview with Chilean industry representatives, December 13, 2005, Quillota, Chile.

Oranges and lemons: Chilean production, by region

Item and region	Quantity (metric tons)	Share of total (percent)
Oranges:		
Region III	1,015	1
Region IV	3,860	5
RM (Metropolitan)	24,957	33
Region V	8,824	12
Region VI	37,128	49
Total, oranges	75,784	100
Lemons:		
Region III	1,587	1
Region IV	32,888	28
RM (Metropolitan)	42,431	36
Region V	20,285	17
Region VI	19,885	17
Total, lemons	117,076	100

Source: ODEPA, CIREN, *Catastro Frutícola*, various regions.

Note: Data are for various years and may not be comparable with other production data presented in this report.

A combination of climate, soil, and water availability largely determines the location of producers. These regions of Chile, while largely exhibiting a Mediterranean climate, comprise a variety of microclimates. Citrus producers seek specific growing conditions within these microclimates, such as ample water for irrigation, adequate soil drainage, frost protection, nematode-free soil, and daily temperature variations. The presence of microclimates has contributed to fragmentation in the Chilean citrus sector, as producers locate in areas with optimal growing conditions.

Structure and Organization

In Chile, oranges and lemons are produced by a relatively large number of growers and a smaller number of packers, who are usually also exporters. These growers and packer/exporters are becoming larger and more integrated, both vertically and horizontally, and are increasingly focused on export markets.[12] In addition, non-affiliated growers and packer/exporters cooperate in activities such as technical and commercial information exchanges, market analysis, and forecasting.[13] There is also a trend in which independent growers are forming their own export groups.[14] As discussed earlier, the industry is relatively fragmented with respect to growing areas, owing mainly to climatic conditions and geographic factors.

[12] Interview with Chilean industry representatives, December 12-16, 2005, various regions, Chile.
[13] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.
[14] Interview with Chilean government officials, December 12, 2005, Santiago, Chile.

Figure 7-1 Chile: Orange and lemon growing regions

Growers

There are approximately 1,300 farms that grow oranges and 1,500 farms that grow lemons in Chile (table 7-3). The largest number of farms growing oranges are located in Region VI, while the greatest number of lemon farms are in Regions V and RM. The distribution of farms has been determined largely by factors related to growing conditions.

Table 7-3 Oranges and lemons: Number of farms in Chile, by region

	Region and year					
Item	III (2005)	IV (2005)	RM (2004)	V (2002)	VI (2003)	Total
Number of farms:						
Oranges	20	95	350	269	521	1,255
Lemons	14	139	469	575	275	1,472
Share of total (percent):						
Oranges	2	8	28	21	42	100
Lemons	1	9	32	39	19	100

Source: ODEPA, CIREN, *Catastro Frutícola*, various regions. Data are aggregated for various years.

According to the latest nation-wide survey, there were 2,446 orange farms and 3,587 lemon farms in 1997.[15] Approximately 57 percent of both orange and lemon producers in 1997 were classified as small.[16] However, the bulk of the planted area was accounted for by large producers– 45 percent for oranges and 52 percent for lemons. It is believed that the share of both the number of producers and the production area accounted for by large producers has increased since that time.[17] Currently, the most prominent scale for Chilean citrus production is medium in size, about 20 hectares. About 80 percent of growers strive to ship at least a portion of their production to the export market.[18]

Packing Operations

Most Chilean orange and lemon packing operations are owned by export companies, many of which also own orchards. Packing houses are located in growing regions. However, given the scattered locations of orchards, fruit from many outlying orchards must be transported relatively long distances to packing facilities.[19] Packing houses generally employ modern technology and handle several types of fruit in addition to citrus, including avocados, stone fruit, kiwi fruit, and grapes.[20] This lowers costs, retains labor throughout the year, and enables exporters to provide a wider range of products to their buyers.

Integration

As previously mentioned, the Chilean citrus industry has become more vertically integrated in recent years. Large export companies, which typically own packing facilities, have been investing in orchards.[21] In addition, growers have joined together to form export groups.[22] Exporters generally procure supplies under contracts, licenses, or agreements in the absence of ownership.[23] Growers typically commit to supply one to two exporters during a season.[24] Vertical integration provides advantages in terms of costs and quality control, particularly in light of the scattered locations of growing operations. It also improves the dissemination of market information, which assists in efforts to focus on export markets.

[15] ODEPA-INDAP, *Agricultura Chilena*, 120.

[16] Interview with Chilean government officials and industry consultant, December 12, 2005, Santiago, Chile. Typical size ranges for citrus growers are small (less than 7 hectares), medium (between 7 and 70 hectares) and large (more than 70 hectares).

[17] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.

[18] Interview with a Chilean exporter representative, December 16, 2005, La Ligua, Chile.

[19] Interview with a Chilean industry representative, December 16, 2005, Petorca, Chile. One farm that was visited was located in an isolated valley, a substantial distance from the packing house in Polpaico, which is located in the Santiago Metropolitan Region.

[20] Interview with Chilean government officials, December 12, 2005, Santiago, Chile. See also Agricom's and Propal's description of packing houses, available at *http://www.agricom.cl/contenidos/sitio/index.asp*, and at *http://www.propal.cl/eng/infraes_i.html*, respectively.

[21] Interview with Chilean industry and trade association representatives and government officials, December 12-16, 2005, various regions, Chile.

[22] Interview with a Chilean trade association representative, December 12, 2005, Santiago, Chile.

[23] Interview with Chilean government officials, December 12, 2005, Santiago, Chile.

[24] Interview with Chilean industry representatives, December 14-16, 2005, various regions, Chile.

Industry Organizations

As noted, the Chilean fruit export industry is organized into export groups. The main export group, ASOEX, represents those firms that account for the bulk of orange and lemon exports.[25] Another industry group, Fedefruta, represents interests of Chilean fresh fruit producers, including exporters.[26] The Fundación para el Desarrollo Frutícola (FDF) is a private, nonprofit group that assists growers with technical issues.[27] Further, the Chilean Fresh Fruit Association provides export marketing information and assistance.[28]

Market Overview

Product Utilization

Most Chilean orange and lemon production is destined for the domestic market (table 7-4). The domestic market predominately consumes fresh oranges and lemons, and a minor share of output is further processed. Chilean imports of oranges and lemons are negligible, owing in part to phytosanitary restrictions.

Table 7-4 Oranges and lemons: Destination of production in Chile (percent share)

Item	Exports	Domestic	Processing	Loss	Total
Oranges	14	84	1	1	100
Lemons	29	69	([a])	2	100

Source: ODEPA, CIREN, *Catastro Frutícola*, various regions. Data are aggregated for various years.

Note: Data may not be comparable with other data presented in this report owing to methodological variations.

[a]Less than 1 percent.

Domestic Consumption

Domestic consumption of fresh oranges and lemons increased during 2000-2004 (tables 7-5 and 7-6). A major factor has been a shift from distribution through traditional markets to supermarket distribution.[29] Per capita consumption of oranges and mandarins in Chile trails the world average, while that of lemons and limes exceeds the world average. Domestic demand for fresh lemons has been dampened by the increasing use of substitutes, such as citric acid, in recent years.[30]

Pricing and Marketing

Pricing in the Chilean fresh citrus market is largely on consignment. This results mainly from short-term variations in factors such as supply and demand conditions and product quality that contribute to significant fluctuations in prices. Producers generally do not hold fruit in cold storage for long periods, but rather send it to market terminals soon after harvest.

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[25] For more information, see *http://www.asoex.cl*.
[26] For more information, see *http://www.fedefruta.cl*.
[27] For more information, see *http://www.fdf.cl*.
[28] For more information, see *http://www.cffausa.org/dev/index.htm*.
[29] ODEPA, "Mercado de los frutos cítricos."
[30] Interview with Chilean government officials, December 12, 2005, Santiago, Chile.

Table 7-5 Oranges: Chilean imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	97	1	3	95	1	3
2001	101	1	5	97	1	5
2002	114	([a])	6	108	([b])	5
2003	120	([a])	9	111	([b])	8
2004	125	([a])	18	107	([b])	14
2005	140	([a])	21	119	([b])	15

Source: USDA ,FAS, PSD data; ODEPA.

[a]Less than 500 metric tons.
[b]Less than 0.5 percent.

Table 7-6 Lemons: Chilean imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	126	1	18	109	1	14
2001	132	([a])	21	111	([b])	16
2002	140	([a])	26	114	([b])	19
2003	150	([a])	29	121	([b])	19
2004	160	([a])	35	125	([b])	22
2005	165	([a])	35	130	([b])	21

Source: USDA, FAS, PSD data; ODEPA.

[a]Less than 500 metric tons.
[b]Less than 0.5 percent.

Prices in the domestic Chilean fresh orange and lemon market dipped and recovered during 2000-2005 (table 7-7). This trend largely reflected increasing supply and erratic domestic demand.

Table 7-7 Oranges and lemons: Chilean domestic wholesale prices, 2000-2005 (US dollars/kg)

Item	2000	2001	2002	2003	2004	2005
Oranges	0.16	0.13	0.12	0.12	0.13	0.17
Lemons	0.24	0.15	0.16	0.13	0.11	0.16

Source: ODEPA.

Seasonal prices fluctuate substantially. Prices peak during the November-March period, when domestic supplies are low. Conversely, low domestic prices during May-October correspond to peak production volumes. Table 7-8 shows monthly wholesale prices for oranges and lemons in the Santiago market during 2005.

Table 7-8 Oranges and lemons: Chilean domestic monthly wholesale prices, 2005 (US dollars/kg)

Item	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Oranges	0.29	0.31	0.30	0.27	0.20	0.16	0.12	0.11	0.15	0.20	0.25	0.26
Lemons	0.20	0.23	0.28	0.24	0.19	0.06	0.05	0.05	0.06	0.11	0.18	0.32

Source: ODEPA.

Most citrus for the domestic market traditionally has been distributed through wholesale markets in metropolitan areas such as Santiago. However, an increasing amount of citrus, including oranges and lemons, are sold through supermarket chains.[31]

International Trade

Exports

Although exports account for a significant and increasing share of domestic fresh orange and lemon production, Chile is a relatively minor global supplier of these products. Chilean exports of oranges and lemons currently fill niche markets, both in terms of timing and quality.[32]

Chilean exports of oranges increased more than fivefold in quantity during 2000-2005, totaling 20,800 mt and valued at $11.2 million in 2005 (table 7-9). The increase resulted mainly from gaining access to the Japanese market as well as the development of the EU and Canadian markets. Chilean oranges currently cannot be exported to the U.S. market due to U.S. phytosanitary concerns.[33] Chilean exporters have differing views of their potential to supply oranges to the U.S. market, ranging from a relatively minor quantity to as much as one million 18-kilogram boxes (about 18,000 mt) annually.[34]

Chilean exports of fresh lemons also increased during 2000-2005, nearly doubling in quantity to about 35,000 mt in 2004; the quantity was flat in 2005 (table 7-10). Although Japan is the leading Chilean export market, most of the increase was accounted for by exports to the United States. These two markets account for virtually all exports. Chilean lemon exports to the U.S. market are subject to fumigation with methyl bromide owing to the presence of mites.

The Chilean citrus export sector is relatively concentrated. The top orange exporter and the top lemon exporter accounted for 29 percent and 28 percent, respectively, of the total volume of exports during the 2004/2005 marketing year, based on data from the leading export association.[35] The top 5 exporters of oranges and lemons accounted for 84 percent and 68 percent, respectively, of the total that year.

[31] ODEPA, "Mercado de los frutos cítricos."

[32] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.

[33] Phytosanitary issues are discussed in the section on "Regulatory Compliance."

[34] Interview with Chilean industry and trade association representatives and government officials, December 12-16, 2005, various regions, Chile.

[35] ASOEX, *Expordata Yearbook 2005*, 650. ASOEX members account for the bulk of exports.

Table 7-9 Fresh oranges: Chilean exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Japan	1,196	3,766	5,045	6,158	10,671	11,405
Spain	0	113	148	783	2,537	2,180
Canada	0	0	0	255	1,862	3,758
The Netherlands	0	45	0	296	976	1,404
United Kingdom	257	366	547	665	947	826
Other	1,924	902	380	1,263	1,209	1,227
Total	3,377	5,192	6,120	9,420	18,202	20,800
	Value (1,000 dollars)					
Japan	828	2,310	3,172	3,869	7,345	6,500
Spain	0	46	46	334	1,374	1,119
Canada	0	0	0	140	1,254	1,682
The Netherlands	0	22	0	158	656	735
United Kingdom	133	212	363	418	618	441
Other	1,089	436	209	699	628	752
Total	2,050	3,026	3,790	5,618	11,875	11,229
	Unit value (dollars per metric ton)					
Japan	692	613	629	628	688	570
Spain	([a])	407	311	427	542	513
Canada	([a])	([a])	([a])	549	673	448
The Netherlands	([a])	489	([a])	534	672	524
United Kingdom	518	579	664	629	653	534
Other	566	483	550	553	519	613

Source: ODEPA.

[a]Not available.

Table 7-10 Fresh lemons: Chilean exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Japan	10,927	13,062	15,110	14,089	14,515	13,622
United States	6,970	6,755	10,742	14,288	19,405	20,349
Saudi Arabia	0	181	14	0	793	48
China	0	0	0	23	124	0
Poland	0	0	0	0	147	0
Other	150	970	66	279	112	1,006
Total	18,047	20,968	25,932	28,679	35,096	35,025
	Value (1,000 dollars)					
Japan	10,365	11,596	16,077	13,562	12,549	9,798
United States	3,697	3,287	6,014	7,767	10,131	8,886
Saudi Arabia	0	78	5	0	375	22
China	0	0	0	11	96	0
Poland	0	0	0	0	36	0
Other	79	169	43	293	69	629
Total	14,141	15,130	22,139	21,633	23,256	19,335
	Unit value (dollars per metric ton)					
Japan	949	888	1,064	963	865	719
United States	530	487	560	544	522	437
Saudi Arabia	([a])	431	357	([a])	473	458
China	([a])	([a])	([a])	478	774	([a])
Poland	([a])	([a])	([a])	([a])	245	([a])
Other	527	174	652	1,050	616	625

Source: ODEPA.

[a]Not available.

Imports

Chilean imports of fresh oranges and lemons are negligible (tables 7-11 and 7-12). Chile imports a small quantity of fresh oranges from the United States and a small quantity of fresh lemons from the bordering countries of Peru and Argentina.

Table 7-11 Fresh oranges: Chilean imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	652	353	17	311	88	55
Other	26	183	2	([a])	0	1
Total	678	536	19	311	88	56
	Value (1,000 dollars)					
United States	375	236	12	210	82	48
Other	8	60	1	([b])	0	1
Total	383	296	13	211	82	49
	Unit value (dollars per metric ton)					
United States	575	669	706	675	932	873
Other	308	328	500	287	([c])	1,000

Source: USDA, FAS, PSD data, ODEPA.

[a]Less than 1,000 metric tons.
[b]Less than $500.
[c]Not available.

Table 7-12 Fresh lemons: Chilean imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Peru	70	133	173	105	232	413
Argentina	519	134	273	0	0	0
Other	([a])	([a])	14	0	0	0
Total	589	267	460	105	232	413
	Value (1,000 dollars)					
Peru	26	51	47	40	142	232
Argentina	253	69	98	0	0	0
Other	1	1	4	0	0	0
Total	280	121	149	40	142	232
	Unit value (dollars per metric ton)					
Peru	371	383	272	381	612	562
Argentina	487	515	359	([b])	([b])	([b])
Other	350	443	286	([b])	([b])	([b])

Source: ODEPA.

[a]Less than 0.5 metric tons.
[b]Not available.

Competitive Factors

The primary competitive factors relevant to the Chilean citrus industry are those that affect production levels, costs, quality, and prices. These factors determine the ability of Chilean producers to enter and compete in export markets. Major factors include climate, availability and costs of inputs, technology, government policies, and proximity to markets.

Chile possesses a variety of microclimates suitable for citrus production, and weather conditions generally are favorable and consistent. Natural barriers offer protection from pests and diseases, and water is available for irrigation. Land generally is available, but suitable locations are scattered. Labor is also generally available, but costs have been rising. Costs of other inputs– such as energy, plastic irrigation pipe, fertilizers, and chemicals –have also been rising. A recent strengthening exchange rate vis-à-vis the United States has eroded export revenues, as trade generally is denominated in U.S. dollars. Producers employ current technology and cultural practices to produce export-quality fruit. Chilean exporters generally comply with the phytosanitary protocols and quality requirements of major export markets. Yields are somewhat lower than those of other global competitors for oranges but similar for lemons. Chile's position in the Southern Hemisphere is counterseasonal with respect to producers in primary consuming markets including the United States and the EU; however, Chile faces competition from hemispheric competitors, namely Argentina, South Africa, and Australia.

Natural Endowments

Chilean citrus production is located mainly in a dry Mediterranean climate, which includes a variety of microclimates, soils, and topographies. Weather conditions are relatively benign and predictable.[36] Chile is a long, narrow country bordering the Pacific Ocean to the west, the Andes to the east, and Patagonia to the south, and the bulk of citrus production occurs in the middle part of the country. Citrus groves are located in proximity to water, as producers generally irrigate their orchards. In general, groves are located along rivers in transversal valleys, with dams providing water storage.[37] The dry climate and irrigation enables the control of water and contributes to a relatively low incidence of fungi and diseases. Natural barriers –namely a desert to the north, the ocean to the west, and the mountains to the east –limit the incidence of most pests. These conditions improve quality and increase the yield of export-quality fruit and contribute to a more even and reliable supply. They also require a lower use of pesticides and fungicides. However, suitable growing conditions tend to be clustered in relatively small and scattered areas, leading to a fragmented industry structure.[38] In addition, a problem with soil nematodes in some growing areas requires lemon growers to relocate groves after the typical 12-15 year productive life cycle.[39]

Water Issues

The availability of water is a significant factor in Chilean citrus production. Given the dry climate, most production relies on irrigation, mainly from water runoff from the Andes mountains and from underground water tables. Virtually all export growers use irrigation, while those producing only for the domestic market do not. Water is generally available, but in limited locations.[40]

For both oranges and lemons, drip irrigation is, by far, the primary type of irrigation used in all regions except for region VI, where trench irrigation is the primary irrigation method

[36] Interview with a Chilean industry consultant, December 12, 2005, Santiago, Chile.

[37] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile. See also Gallasch, Ortúzar, and Anderson, "The Chilean Citrus Industry," 23-26.

[38] Interviews with Chilean industry representatives, December 12-16, 2005, Various regions, Chile.

[39] Interview with a Chilean exporter representative, December 16, 2005, La Ligua, Chile.

[40] Ibid.

for oranges and is used with about the same frequency as drip irrigation for lemons.[41] Region VI is the leading orange production area and the third-leading lemon production area in Chile. However, most citrus production in Region VI is destined for the domestic market.[42] The other regions export most of their citrus and usually employ the newer drip irrigation technologies.[43] As in most global citrus industries, the use of irrigation increases orchard yields of export-quality fruit.

Pests and Diseases

Chile's dry climate and natural barriers contribute to a relatively low incidence of pests and diseases that affect orange and lemon production.[44] The two major pests are mealybugs and mites.[45] The presence of these pests require inspection and fumigation in order to export to certain markets. This increases costs and negatively affects product quality. For example, as mentioned above, lemon exports to the United States must be fumigated with methyl bromide, which decreases the quality of the fruit.

Seasonality

The marketing season for oranges produced in Chile generally is between June and November, as shown in the following tabulation:

Oranges and lemons: Chilean marketing seasons by variety

Item and variety	Marketing season
Oranges:	
Navel Late	June-November
Spring Navel	June-September
Lane Late	July-November
Lemons:	
Genova	May-October
Eureka	June-August

Source: Asociación de Exportadores de Chile A.G., *Fresh Fruits From Chile*.

Lemons are marketed mainly between May and October. Market timing is a crucial factor in the competitiveness of Chilean orange and lemon exports. Chilean citrus producers strive to time their production to enter export markets during periods of relatively low supplies to capture high prices. The introduction of new varieties, mainly early and late maturing varieties, has been driven mainly by efforts to improve market timing and increase competitiveness.[46] As discussed above, seasonality is also a major factor affecting domestic price trends.

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[41] Based on data from ODEPA, CIREN, *Catastro Frutícola*.

[42] Ninety-one percent of orange production and 68 percent of lemon production in the region were for the internal market. ODEPA, CIREN, *Catastro Frutícola*.

[43] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.

[44] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.

[45] Interview with APHIS officials, December 17, 2005, Valparaíso, Chile. See also Gallasch, Ortúzar, and Anderson, "The Chilean Citrus Industry," 20-23.

[46] Interview with Chilean industry representatives, December 12-16 ,2005, various regions, Chile. Interview with Chilean government officials, December 12, 2005, Santiago, Chile.

Labor

Labor is a major input in Chilean citrus production, particularly with respect to export-quality fruit. The use of cultural practices to meet export-market quality standards –such as the installation and maintenance of irrigation systems, soil preparation, spraying, pruning, and picking –is labor intensive. Labor generally is available; however, growers have diversified into other products, such as avocados, in large part to retain their labor force throughout the year. This results not only in increased labor availability but also higher labor skills. Labor costs can account for as much as 70 percent of total farm costs and they have been increasing in recent years.[47] Labor costs in Chile are substantially lower than those in major export markets, such as the United States, but productivity in the Chilean industry also is reportedly lower.[48]

Land

Land ownership and investment restrictions are not an important factor for the Chilean orange and lemon industries, as demonstrated by the recent increase in acquisitions of growing operations by vertically-integrated exporting and packing firms.

Yields

The average yield for orange production in Chile ranged between 13-18 mt/ha during 2000-2005, while that for lemon production ranged between 17-23 mt/ha (tables 7-1 and 7-2). Chilean yields are lower than average global exporter yields for oranges but about the same as other export-oriented producers' yields for lemons.[49] Yields are subject to significant variations depending on climate, weather conditions, and cultural practices. Although the climate and weather conditions are relatively benign in Chile, the presence of microclimates and the scattered locations of citrus producers contribute to differences in yields.

Yields are substantially higher for export-oriented operations which include newer trees and utilize agricultural practices such as irrigation, pruning, and weed control. For example, farm yields can be as high as 40-60 mt/ha for oranges and 70-80 mt/ha for lemons.[50]

Cultural Practices

The bulk of Chilean orange and lemon growers utilize cultural practices that maximize their yield of export-quality fruit. Such practices include the use of virus-free and disease-resistant rootstock that is customized for particular microclimates and growing conditions; high-density,[51] small-tree planting; extensive soil preparation; pruning; irrigation; pest and weed control; harvest condition monitoring and selection; and specific picking and handling techniques.[52] Chilean exporters are certified under certain foreign market quality programs,

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[47] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.

[48] Interviews with Chilean industry representatives, December 15, 2005. Melipilla, Chile.

[49] Based on average yields from FAOSTAT.

[50] Interview with Chilean industry representatives, December 13, 2005, Quillota, Chile. Interview with a Chilean exporter representative, December 16, 2005, La Ligua, Chile.

[51] Planting densities may vary considerably by location. A typical high-density planting is a plot of 6 trees by 3 trees, with 555 trees/ha. Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile. See also Gallasch, Ortúzar, and Anderson, "The Chilean Citrus Industry," 18.

[52] Ibid.

such as EurepGAP.[53] Meeting the standards of such programs generally requires the use of these cultural practices.

Production Technology

Chilean citrus producers for export markets generally employ state-of-the-art technology. This is necessary to meet the stringent quality standards and phytosanitary requirements in these markets and to maximize yields of export-quality fruit. In addition to the technologies mentioned above, such producers use high-speed packing sorters and lines and careful cold-chain controls. Cold storage generally has not been a major competitive factor affecting the Chilean citrus industry, as most fresh oranges and lemons destined for export markets are shipped soon after harvest. Chilean producers report that this provides a quality advantage for lemons, as cold storage can adversely affect quality. Chilean exporters reportedly hold a quality advantage over U.S. exporters in the Japanese lemon market, as Chilean lemons are picked ripe and shipped immediately, whereas in the United States, lemons are generally ripened in cold storage.[54]

Government Policies and Support

Government assistance to the Chilean citrus industry traditionally has been minimal. Government activities generally are limited to such areas as phytosanitary regulation, industry and market information, and trade negotiations. Research and development activities mainly are carried out by industry-funded organizations, primarily the Fundación para el Desarrollo Frutícola, and by academic institutions.[55] Chilean trade policy generally has provided a positive environment for the development of fresh citrus exports. Import duties on major inputs are relatively low, and there are no export taxes. Chile has free trade agreements or associations with several current and potential citrus export markets, including the United States, the EU, and Korea.[56]

Regulatory Compliance

Chilean citrus producers meet domestic food safety and phytosanitary requirements as administered by the Servicio Agrícola Ganadero.[57] As mentioned above, Chilean citrus exporters also meet current quality standards and phytosanitary protocols in export markets –such as EurepGAP, GMP, and HAACP[58] –and they typically strive to meet the most stringent of these requirements in order to export to all markets.[59] The U.S. lemon protocol requires fumigation of Chilean exports, and a protocol currently is under development for orange exports.[60] The orange protocol, which is at the pest risk assessment stage, is expected

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[53] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.

[54] Interview with a Chilean trade association representative, December 13, 2005, Santiago, Chile.

[55] Chilean Fresh Fruit Association, *Catalogue of Chilean Fruit Industry*, Chapter VII.

[56] ODEPA, "Inserción de la agricultura chilena en los mercados internacionales," 30-87.

[57] Interview with Chilean government officials, December 12, 2005, Santiago, Chile.

[58] See, for example, Propal's description at *http://www.propal.cl/eng/control_i.html*. EurepGAP refers to food safety initiatives started by retailers belonging to the Euro-Retailer Produce Working Group (EUREP). For more information, see *http://www.eurep.org/Languages/English/index_html*. HACCP (Hazard Analysis and Critical Control Point), along with GMP (Good Manufacturing Practice) requirements, refer to the U.S. Food and Drug Administration's primary food safety program.

[59] Interview with Chilean government officials, December 12, 2005, Santiago, Chile.

[60] Ibid. Interview with APHIS officials, December 17, 2005, Valparaíso, Chile.

to be completed within the next 2 years. Growers and packers are also subject to labor laws regarding minimum wages, the maximum number of work hours, and work conditions.[61]

Business Climate and Investment

The business and investment climate in Chile generally is open and transparent.[62] The availability of capital generally has not been a major competitive factor in the Chilean citrus industry. Large, multinational export companies have invested in growing and packing facilities and often provide annual operating loans to growers in order to procure supplies for the coming year.[63] Interest rates are relatively low in Chile, ranging between 5-6 percent, but have been rising in recent years.[64] Taxes generally are not a competitive factor in the Chilean citrus industry as there are no corporate taxes and sales taxes are rebated for exports.[65]

Trade-Related Issues

The current structure of the Chilean citrus industry largely has been shaped by participation in global markets. The trend toward vertical and horizontal integration, the shift to early and late varieties and optimal rootstocks, and the use of cultural practices such as irrigation and high-density planting in the Chilean orange and lemon industries occurred mainly in an effort to improve export competitiveness, both in terms of cost and quality. Export prices are substantially higher than domestic prices, and the structure of the Chilean industry is designed to maximize revenues from exports.

Although the domestic Chilean citrus market absorbs the bulk of fresh orange and lemon production, it is relatively small in relation to major global export markets. Thus, the size of the domestic market has had little impact on the competitiveness of the Chilean industry. In addition, traditional domestic distribution channels were not centralized and had little impact on the competitiveness of Chilean exports. Specific distribution channels were developed for agricultural exports, and exporters of fresh oranges and lemons may take advantage of existing distribution arrangements with buyers of other products, such as avocados and grapes, in major export markets.[66]

Exchange rates have varied effects on the competitiveness of the Chilean fresh citrus industry. The Chilean export-oriented industry generally denominates its operations in U.S. dollars, and Chile historically has enjoyed a favorable exchange rate, which provided advantages in pricing and revenues. However, the Chilean peso has strengthened in recent years, mitigating these advantages. In contrast, many inputs such as fertilizers and chemicals are imported, and the strengthening of the peso effectively decreased the costs of these imports. Exchange rates with other leading currencies also affect Chilean export competitiveness, as other major export markets include Japan and the EU. The value of these

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[61] Interviews with Chilean industry representatives and consultants, December 12-16, 2005, various regions, Chile; Chilean Fresh Fruit Association, *Catalogue of Chilean Fruit Industry*, VI-198.

[62] See, e.g., U.S. Department of Commerce, “Doing Business in Chile.”

[63] Interview with Chilean industry and trade association representatives and government officials, December 12-16, 2005, various regions, Chile.

[64] Interview with Chilean industry representatives, December 14, 2005, Melipilla, Chile.

[65] Ibid.

[66] Interview with Chilean trade association representatives, December 12, 2005, Santiago, Chile.

currencies vis-à-vis the dollar affects Chilean exports, as the Chilean industry operates using U.S. dollars.[67]

Chilean orange and lemon growers generally diversify into other crops, such as avocados, clementines, grapes, and nuts. As noted above, such diversification spreads risk, lowers unit production costs, provides a more even product flow throughout the year, and enables producers to retain skilled labor.[68] In addition, increasing vertical integration by major exporters and the demand by foreign buyers to consolidate the number of their suppliers has contributed to this diversification. The Chilean fruit sector is competitive and entrepreneurial in nature, and actively pursues new product and market opportunities.

Costs of Production

Production costs in the Chilean orange and lemon industries are influenced by many factors. Production units tend to be relatively small, scattered, and subject to a large variety of microclimates; thus, the cost structure likely varies considerably according to location and the type and level of technology used. In general, larger and export-oriented farms, which are more likely to use advanced technologies, tend to have lower unit production costs.[69] Most producers utilize good agricultural practices and other methods to conform to quality standards and phytosanitary restrictions in major export markets. Such practices increase input costs, but result in higher yields of export-quality fruit and, thus, higher returns.

The production costs presented in this section are based on Commission field visits and interviews with Chilean producers and exporters. The data are believed to be typical of larger growers and packers that produce fresh oranges and lemons for export, and use appropriate agricultural practices and post-harvest measures. Packing and marketing costs are assumed to be the same for each product. Cost data for oranges only specify labor at the farm level, while the data for lemons are more detailed. Farm labor costs for lemons do not include labor for harvesting. Cost data reflect conditions as of December 2005.

Total Costs

Chilean production costs for fresh oranges are estimated at about $6,400/ha, or $160/mt, at the farm level (table 7-13). Packing and marketing costs account for another $194/mt, with total port delivery costs reported at $354/mt ($6.38 per 18-kg box). Farm-level costs for fresh lemons totaled approximately $8,600/ha, or $143/mt (table 7-14). Packing and marketing costs for lemons are estimated at $203/mt, with total delivery costs estimated at $347/mt ($5.97 per 17.2-kg box).

Major Cost Components

Farm-level costs account for roughly one-half of the total port delivery costs for Chilean fresh orange and lemon exports (tables 7-13 and 7-14). Labor is, by far, the primary cost component at the farm level for both orange and lemon production in Chile. Labor, including

[67] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.
[68] Ibid.
[69] Interview with a Chilean industry consultant, December 12, 2005, Santiago, Chile.

harvest, accounts for 70 percent of farm costs for fresh oranges.[70] Labor accounts for nearly one-half of fresh lemon farm costs and is the primary component of the harvest cost. The base salary is about $10 per day, plus benefits, for a minimum quantity harvested, with incentives for additional quantities.[71] Citrus production for export is relatively labor intensive as a result of cultural practices such as high-density planting,[72] pruning, spraying, and hand-picking for harvest.

Table 7-13 Oranges: Chilean costs of production, packing and marketing, and cost shares, 2005

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Value (US dollars/ 18 kg carton)	Share of total (percent)
Farm costs:				
Labor	4,480	112	2.02	70
Other	1,920	48	0.86	30
Total, farm costs	6,400	160	2.88	100
Farm costs			2.88	45
Packing and marketing costs (packinghouse, box, insurance and transport to port, exporters' commission)		194	3.50	55
Total product costs		354	6.38	100

Source: Compiled and estimated by the Commission based on field interviews with Chilean industry representatives, December 12-16, 2005. Converted to U.S. dollars by Chilean industry representatives. Per-unit costs assume yields of 40 mt/ha.

Table 7-14 Lemons: Chilean costs of production, packing and marketing, and cost shares, 2005

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Value (US dollars/ 17.2 kg carton)	Share of total (percent)
Farm costs:				
Operating costs:				
Labor (excluding harvest)	2,000	33	0.57	23
Machinery and fuel	400	7	0.11	5
Electricity and irrigation	700	12	0.20	8
Fertilizer, pesticides, fungicides	2,000	33	0.57	23
Harvest (labor, machinery, fuel, transport to packing house)	2,000	33	0.57	23
Other (pruning tools, safety equipment, harvest containers)	500	8	0.14	6
Total, field costs	7,600	127	2.18	88
Management costs	600	10	0.17	7
Administrative costs	400	7	0.11	5
Total, farm costs (to packing house)	8,600	143	2.47	100
Farm costs			2.47	41
Packing and marketing costs (packing house, box, insurance and transport to port, exporters' commission)		203	3.50	59
Total product costs		347	5.97	100

Source: Compiled and estimated by the Commission based on field interviews with Chilean industry representatives, December 12-16, 2005. Converted to U.S. dollars by Chilean industry representatives. Per-unit costs assume yields of 60 mt/ha.

[70] Reported labor costs are high compared to that reported for other countries and may include other labor costs such as management labor cost and labor for other aspects of production, including harvesting.

[71] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.

[72] High-density planting limits the access of machinery such as tractors.

Cost Considerations

Production costs have been rising in recent years. Labor costs have risen 40 percent during the last 2 years.[73] Costs of other inputs –namely energy, fertilizers, chemicals, and plastic irrigation pipe–have increased, mainly as a result of rising petroleum prices.[74] Land prices, which vary greatly depending on location, soil quality, and water access, have also been rising. The price for land on hills was $300/ha 10 years ago and currently is about $4,000/ha.[75] Current prices for land in various regions and conditions range between $4,000–$30,000/ha, with water rights.[76] Water rights currently cost between $4,000–$10,000/ha. Production areas are scattered and some are relatively distant from packing houses and export facilities, which contributes to costs. Chile's distance from major export markets also contributes to costs, but shipments are counterseasonal, and other major southern hemisphere exporters face similar distances to these markets.

[73] Interview with Chilean industry representatives, December 15, 2005, Melipilla, Chile.
[74] Interview with Chilean industry representatives, December 12-16, 2005, various regions, Chile.
[75] Interview with a Chilean industry consultant, December 12, 2005, Santiago, Chile.
[76] Interviews with Chilean industry representatives, December 12-16, 2005, various regions, Chile.

CHAPTER 8
People's Republic of China

Introduction

China ranks as one of the world's largest producers and net-exporters of citrus.[1] This ranking is mostly attributable to China's mandarin production, which accounts for more than one-half of its total citrus production. Orange and lemon production is still relatively small-scale, and China must import fruit to meet its rapidly growing domestic demand. Tree-plantings and production of oranges and lemons have expanded quickly, facilitated by government initiatives to develop citrus production in certain southern inland provinces. Nevertheless, development of China's commercial citrus industry remains constrained by poor post-harvest conditions and persistent infrastructure constraints, resulting in high farm-to-market costs. Farm-level production costs are low, however, largely because most production continues to be small-scale and labor-intensive, with limited use of modern technologies and management practices. Long-term capacity growth is also limited by diminishing land availability and a short production season. There are ongoing efforts to modernize the citrus sectors and improve farm-level production and post-harvest treatment. Recent investment in fruit processing and larger-scale citrus packing and distribution facilities is improving domestic production of high-quality fresh citrus fruit for the commercial market.

Industry Overview

Production Trends

China's citrus industry has grown sharply during the past decade, totaling 15 million mt on 1.6 million hectares in 2004.[2] Since the early 1990s, China's total citrus acreage expanded by nearly 50 percent and production almost doubled. Orange and lemon production and planting areas grew at an even faster rate during this period. Continued production gains are expected in some sectors, given that much of China's citrus acreage consists of newly-planted, immature trees. An estimated 70 percent[3] to 85 percent[4] of trees are fruit-bearing. However, compared to the very rapid rates of growth during the late 1990s, overall annual growth in China's citrus production has slowed in recent years. Information on new tree plantings is not available; however, harvested area is growing.[5] China's Ministry of

[1] In 2004, China ranked as the world's second largest citrus producer, with 13.5 percent share of global production, following Brazil (19.0 percent). The United States ranked third (13.7 percent). FAOSTAT data (2005).

[2] Interview with Chinese government officials, February 21 and 23, 2006, Beijing and Chongqing, China.

[3] Deng, "China's Import and Export of Citrus Fruits;" Interview with Chinese government officials, February 21, 2006, Beijing, China.

[4] USDA, FAS, *GAIN Report* No. CH3132.

[5] USDA, FAS, *GAIN Report* No. CH4062. USDA reports that new tree plantings are rare and that farmers prefer to top graft new varieties from a portion of their orchard, which allows trees to bear fruit in one year and avoids long-term loss of income. Farmers typically replace only a small fraction (less than 20 percent) of their groves at a time to avoid a complete loss of income.

Agriculture (MOA) reports that average citrus yields are about 7.5 metric tons (mt) per hectare, with more recent estimates averaging slightly higher.[6]

Rapidly growing orange production is resulting in a slow shift in the overall varietal structure of China's citrus sector, shown by a declining share of mandarins and an increasing share of oranges.[7] Shares vary depending on the reported data: mandarins account for 55-70 percent of production, while oranges account for 20-30 percent.[8] Lemon volumes are much lower, estimated at well under 1 percent of all citrus production. Orange orchards account for more than 35 percent of China's citrus-planting area (nearly 600,000 hectares) with production in 2005 forecast at 4.5 million mt (table 8-1). There are no reported statistics on China's navel orange production, but industry researchers estimate that navel oranges account for about one-half of China's orange production, or more than 2 million mt produced annually.[9] There are also no reported statistics on China's lemon sector, but MOA estimates production at about 100,000 mt annually.[10] Limited available information indicates that navel and lemon production may have more than doubled in the past 5-years, as indicated in the following two tabulations.

Table 8-1 Oranges: Chinese production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	2,635	3,598	3,600	4,036	4,250	4,450
Production value (1,000 US dollars)	2,090	2,860	3,130	2,910	2,810	2,670
Area planted (1,000 ha)	382	410	432	570	590	598
Area harvested (1,000 ha)	344	350	360	490	510	520
Annual yield (mt/hectare)	7.7	10.3	10.0	8.2	8.3	8.6

Source: USDA FAS, *GAIN Reports* Nos. CH2055, CH3132, CH4062 and CH5084; USDA, FAS, Production, Supply, and Demand (PSD) data. 2005 forecast production. Value of production calculated from PSD production data multiplied by national average wholesale market price data from China Fruit Marketing Association, reported by USDA. Wholesale prices not available for 2000 and 2001; value calculated assuming average prices during 2002-2003.Production data for oranges may vary because of difficulty distinguishing between oranges ("cheng" varieties) and mandarins ("gan" and "ju" varieties). Harvested acres not reported by USDA after 2002 and are estimated based on the area harvested as a share of area planted, rounded to the nearest ten thousandth. Yield calculated based on harvested area.

[6] Deng, "China's Import and Export of Citrus Fruits;" Yields vary widely given the continued practice of high density tree-plantings.

[7] Liu, "Past, Present, and Future;" USDA, FAS, *GAIN Report* No. CH3132. USDA predicts additional decreases in the share of mandarins grown.

[8] Interview with Chinese government officials, February 21 and 23, 2006, Beijing, and Chongqing, China; USDA, FAS, *GAIN Reports* Nos. CH3132 and CH4062; UN, FAO, *Citrus Production, Consumption and Trade*. Production data may vary because of difficulty distinguishing between oranges ("cheng") and mandarins ("gan" and "ju" varieties). Reported data on orange production may include some types of mandarins in part because of the production and popularity of various mandarin-orange hybrid varieties. Remaining production consists of pomelos (10 percent) and other miscellaneous citrus fruit.

[9] Interview with Chinese government officials, February 23, 2006, Chongqing, China.

[10] Interview with Chinese government officials, February 21, 2006, Beijing, China.

Navels: Chinese estimated production volume, value, bearing acreage, and yields, 2000 and 2005		
	Navel oranges	
Item	2000	2005
Production volume (1,000 mt)	800	2,200
Area harvested (1,000 ha)	100	250
Annual yield (mt/hectare)	8	9
Source: USDA, FAS, Interview with Chinese government officials, February 21, 2006, Beijing, China.		

Lemons: Chinese estimated production volume, value, bearing acreage, and yields, 2000 and 2005		
	Lemons	
Item	2000	2005
Production volume (1,000 mt)	50	100
Area harvested (1,000 ha)	6	9
Annual yield (mt/hectare)	8	9
Source: USDA, FAS. Interview with Chinese government officials, February 21, 2006, Beijing, China.		

Major domestically-produced orange varieties include Jincheng, Valencias, navels, and other local varieties. Primary navel varieties include Newhall, Washington, Robertson, Navelina, Pengle, Thomson, and Carter, as well as "Chinese-brand" local cultivars, such as Xinfeng and Shimian navels, and other Chinese hybrids.[11] Recently, there have been plantings of some late-maturing orange varieties, including Barnfield cultivars. Orange rootstock includes trifoliate orange and trifoliate hybrids such as imported Troyer citrange and Swingle citrange.[12] Main lemon varieties include Eurekas and Lisbons, as well as local lemon varieties, usually using red tangier rootstock.[13]

Growing Regions

Most orange and lemon production is located inland in the southern provinces, along the middle and upper reaches of the Yangtze River and southern areas of Jiangxi, Hunan, and Guangxi provinces (figure 8-1). The top five orange producing provinces account for about 75 percent of China's production, located in Sichuan, Guangxi, Chongqing, Guangdong, and Hunan provinces.[14] Other orange-producing provinces include Jiangxi, Fujian, and Hubei (about 20 percent). Orange production is centered in the provinces as follows:

[11] Interview with Chinese government officials, February 23, 2006, Chongqing, China.

[12] Ibid. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China.

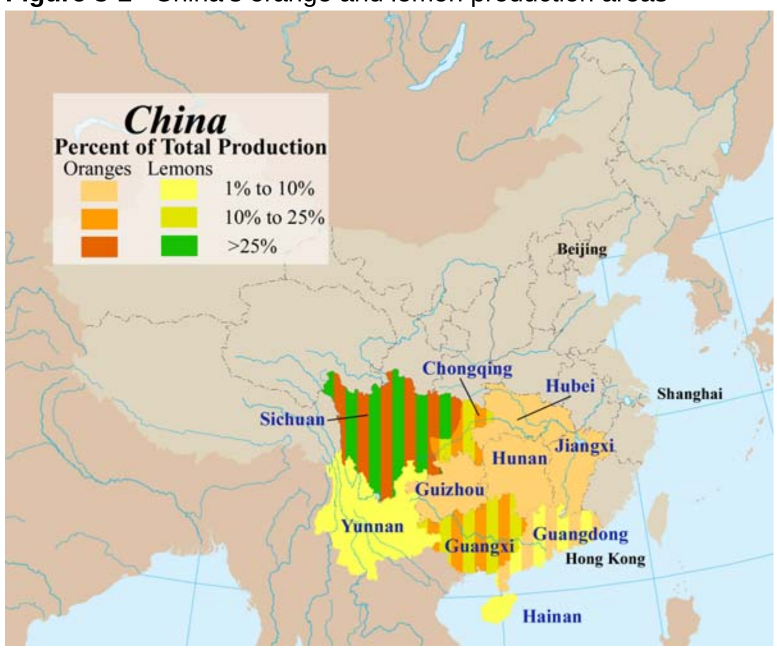
[13] Ibid. A citrus rootstock is a citrus variety of which the fruit is not usually consumed, which already has an established, healthy root system, and is used for grafting a twig from another tree. The rootstock imparts compatibility to various soil types, disease resistance, yield, fruit quality or tree vigor to the variety. See: Wright, *Budding Citrus Trees.*

[14] USDA, FAS, *GAIN Report* No. CH4062.

Oranges: Chinese production by region, 2003 (1,000 mt and percent share)		
Region	Volume	Share
Sichuan	512	28
Guangxi	296	16
Chongqing	226	12
Guangdong	171	9
Hunan	163	9
Jiangxi	141	8
All Other	300	17
Total	1,809	100

Source: USDA, FAS, *GAIN Reports* Nos. CH3132 and CH4062. Based on reported information for "cheng" varieties only (exclusively oranges). Production data for oranges may vary because of difficulty distinguishing between oranges ("cheng") and mandarins ("gan" and "ju" varieties), including mandarin orange hybrids. Total may not add due to rounding.

Figure 8-1 China's orange and lemon production areas



The main navel production area is southwestern Jiangxi, southern Hunan, northeastern Guangxi, and north Guangdong provinces.[15] Estimates of navel production in Jiangxi are about 500,000 mt, roughly one-fourth of total navel production.[16] A secondary navel production area is in the Yangtze River valley (from southern Sichuan province to eastern Chongqing province) and north of the Yangtze River (eastern Hubei province). China's MOA reports that about one-half of China's lemon production is centered in Sichuan province (mostly in Anyue county) and another 20 percent is located in the Chongqing province.[17] Lemons are also grown in Guangxi, Yunnan, Hainan, and Guangdong provinces, as shown in the following tabulation.

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[15] Interview with Chinese government officials, February 23, 2006, Chongqing, China.
[16] Interview with U.S. citrus industry officials, February 27, 2006, Shanghai, China.
[17] Interview with Chinese government officials, February 21, 2006, Beijing, China.

Lemons: Chinese production by region, 2005 (1,000 mt and percent share)		
Region	Volume	Share
Sichuan	50	50
Chongqing	20	20
Guangxi	20	20
Yunnan, Hainan, and Guangdong	10	10
Total	100	100

Source: Interview with Chinese government officials, February 21, 2006, Beijing, China. Numbers shown are approximate.

China's citrus production in some southern inland provinces, especially orange production, has been actively promoted by national and local government initiatives and with initial assistance from a World Bank loan.[18] In part these efforts fall under China's rural development policies and poverty alleviation and income-enhancement schemes directed at farmers with small landholdings.[19] These efforts have contributed to expanded citrus production and tree plantings starting in the early 1990s along the so-called "Yangtze Citrus Zone" (including Sichuan, Chongqing, and Hubei provinces). In 2002, Chongqing launched its "Million Ton Citrus Project," a project to plant new orange groves and raise orange production to one million mt by the year 2010.[20] Large-scale integrated orange production projects are also being constructed or planned in Sichuan, Jiangxi, and Hubei under various provincial and local government policy initiatives.

Structure and Organization

Growers

The majority of China's agriculture production is typified by a large number of small-scale, family-run household farming operations, located in mostly poor, remote communities. The majority of farmers manage small-sized plots up to 1 hectare in size, but often production is on multiple non-contiguous plots of less than one-fourth an hectare.[21] Production is typically low-technology and labor-intensive, using no machinery or draft animals (mostly hand-tilled). Grower operations are either individual farms or, more commonly, smaller farm operations that have consolidated, usually at village-level.[22] Multi-family, collectively-farmed orchards usually have more than 200 families, or about 1,000 people, farming a total of more than 100 hectares across a range of crops.[23] There are some large-scale, privately-owned citrus groves in China, between 30 and 60 hectares in size, utilizing land leased from

[18] Liu, "Past, Present, and Future;" USDA, FAS, *World Agricultural Production Part Two*; UN, FAO, *Citrus Production, Consumption and Trade*; House, *Big Picture*.

[19] Interview with Chinese government officials, February 21 and 23, 2006, Beijing and Chongqing, China. At the national level, MOA guidance is directed at identifying suitable growing areas, promoting specific citrus varieties, and constructing demonstration farms often with assistance from international organizations.

[20] Murray, "Not the quietest year;" USDA, *GAIN Report* No. CH3132. Half of all production is planned for processing and juicing, with longer-term plans to develop the area into Asia's largest orange processing base.

[21] Gale, "China at a Glance," 8.

[22] Hongqi and Wahl, "Recent Developments."

[23] Eddy, "Fear not – yet."

state-owned entities, individual farmers, or cooperatives.[24] The number of citrus producers is not known, but given that China has about 240 million farms,[25] there are likely millions of citrus producers, similar to the reported number of growers in other fruit sectors.[26]

About 80 percent of all fruit purchases in China are by small-scale local traders or their agents (usually operations with 2-6 people) who transport fruit to provincial or regional wholesale markets where it is sold to retailers, hotels and individuals.[27] In most cases, traders negotiate prices directly with growers before harvest based on fruit quality, mostly through on-the-spot cash payments.[28] Even when growers operate under a village collective or grower cooperative, there is typically no cooperation among households, and traders tend to negotiate prices on a per-household basis because of differences in varieties and fruit quality.[29]

Packers

There are only a limited number of larger-scale commercial packing facilities in China's orange and lemon sectors, but the number of packers is increasing. Only an estimated 15 percent of citrus fruit currently undergoes commercial treatment (e.g., washing, waxing, grading, labeling, color-added, and packed in cartons) despite an estimated capacity to handle about 30 percent of all citrus produced.[30] Some newly-built facilities are not fully operational because many trees have not yet reached the maturity required to meet an individual packer's variety/cultivar, quality or grade specifications. Low capacity utilization at some packing facilities is also a result of China's short production season, given China's single harvest and limited use of late- and early-maturing varieties. Existing market channel inefficiencies likely also contribute to low supplies given that fruit is sourced from many small-scale farmers.

There are few citrus packing facilities that use advanced packing line technologies.[31] A newly-built packing operation in the Chongqing area has a capacity of 3,000-5,000 mt and is able to pack about 15 mt/hour using European-developed advanced technology.[32] Wholesale market traders and distributors – both smaller-sized fruit traders and larger commercial entities – may also pack fruit and have access to smaller-scale packing lines.[33]

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[24] Interview with Chinese government officials, February 21, 2006, Beijing, China. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China. There are also projects initiated by some local governments involving cooperation and investment by individual farmers, such as the Chongqing Million Ton Citrus Project.

[25] Huang and Rozelle, "China's Accession to WTO," 32.

[26] Warner, "A Different Perspective." For example, the number of apple growers is estimated to be in the millions.

[27] Rozelle and Huang, "China and the Economic Forces." Other fruit procurement is through supermarkets, cooperatives, processing firms, and supply firms (total under 10 percent), and pick-your-own.

[28] USDA, FAS, *GAIN Report* No. CH4062.

[29] Interview with Chinese government officials, February 22, 2006, Beijing, China. Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China.

[30] Ibid.

[31] Nassif, " China: A Country of Contrasts," 12-25.

[32] The packing facility was built in 2003. The packing line includes wash, fungicide, wax, and grade, and operates both a weight-based and/or a camera system for sorting fruit. The facility has about 2,000-3,000 mt cold storage capacity, but does not have a controlled-atmosphere system. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China.

[33] Interview with Chinese citrus industry officials, February 27, 2006, Shanghai, China. Information based on major fruit traders and distributors selling at both Long Wu wholesale market (Shanghai) and Simaqiao

(continued...)

Some small-scale traders may both grow and pack their own fruit and also fruit from neighboring farmers. Before sale at a local wholesale market, the fruit is often packed using a small packing line (under 15 meters), which washes, sorts, and waxes the fruit. Usually the fruit is individually wrapped and boxed by hand.

Most existing packer/distributors are Chinese-owned companies; however, there are recent reports that firms from Hong Kong, Macau and elsewhere may also be investing in commercial packing facilities and engaging in contractual arrangements in the major growing provinces of Sichuan-Chongqing and Jiangxi.[34] Overall, however, there is currently little foreign investment in China's orange and lemon industry.[35] Recently, some Chinese-owned brands have gained prominence at the distributor-level and there has been more active domestic marketing of domestic oranges and lemons, particularly from the major developed producing areas of Sichuan-Chongqing, Jiangxi, and also Hainan.[36] There are also indications that some packing facilities are entering into arrangements to pack and distribute domestically-grown fruit under a franchise arrangement with a foreign-owned citrus company.[37]

Integration

Low-level commercial treatment and packout rates for citrus are, in part, attributable to poor coordination between growers and buyers–a common problem throughout China's fruit sectors. Because there are many small-scale orchards, mostly selling directly to market, there are additional challenges for transportation and packing, resulting in low packout rates.[38] Recently the use of contractual arrangements between growers and packer/distributers has become more common, signaling the increased use of vertical integration strategies.[39] Typically this involves individual farmers or consolidated farm operations at the village level growing fruit under contract with an individual packer, usually a private Chinese-owned so-called "dragon-head" company.[40] For example, a packing facility in the Chongqing area has contracts with about 2,000 farmers. Of these farmers, the majority of growers operate plots of about 1 hectare each; only about 50 are larger-sized operations with about 30-60 hectares. The packing facility specifies the varieties and certain quality specifications and negotiates pre-harvest contract prices (usually 1-year beforehand) with the grower. The packing facility provides no financial support but may provide management assistance and information focusing on improved cultivation, pre-harvest technology, and post-harvest handling. Most information and technology transfer is through the use of large-scale demonstration farms

[33] (...continued)
fruit wholesale market (Chengdu, Sichuan province).

[34] Interview with Chinese citrus industry officials, February 24 and 27, 2006, Chongqing and Shanghai, China.

[35] Interview with Chinese citrus industry officials, February 22 and 27, 2006, Shanghai and Beijing, China.

[36] Interview with Chinese citrus industry officials, February 27, 2006, Shanghai, China. Some recognized domestic brands/companies include "Golden Sunshine," "Tianzi," "Hua Sheng," and "Anlong Fruit."

[37] Based on box labels at the Long Wu wholesale market outside of Shanghai indicating that a Chongqing-based fruit company was packing navel oranges "sold under license" for South Africa's Outspan.

[38] Warner, "A Different Perspective."

[39] Interview with Chinese government officials, February 22, 2006, Beijing, China. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China.

[40] Interview with Chinese government officials, "Dragon-head" companies are a main source of commercial growth through increased business investment and information/technology transfer.

or nursery operations supplying improved varieties to growers.[41] Some farmers have been approached by potential contractors and declined because they were unable to agree on a pre-harvest contract price and because of concerns that the contractor wanted to control pre-harvest conditions.[42]

Most high quality fruit is marketed and distributed through large-scale, relatively modern wholesale markets that receive fruit from both small-scale traders and also larger packing facilities. Increasingly, some privately-owned packing companies are selling or exporting fruit directly. A sizeable share of China's citrus production is still sold through local wet markets[43] and street-stands. This fruit is mostly destined for local domestic consumption and is usually lower in quality or consists of local or hybrid citrus varieties such as orange-mandarins.

Market Overview

Production Utilization

About 94 percent of China's total citrus production is consumed fresh domestically, with about 4-5 percent processed and 2 percent exported.[44] Canned mandarin oranges dominate processed citrus production. Currently about 6 percent of all orange production is used for processing into juice.[45] There are ongoing efforts to further develop China's orange juice industry, but, to date, growth in China's orange juice sector has been limited by an overall limited supply of oranges and a shortage of the proper types of oranges needed for juicing. In addition, China's short production season results in higher annual operating costs at juicing plants making them unprofitable.[46] Nearly all lemon production is sold to the fresh market with very little used for processing or other industrial uses such as lemon oil extract.

Domestic Consumption

Reports of citrus consumption in China vary, but indicate that demand has likely risen in recent years. Demand is currently estimated at about 12 kilograms per person up, from about 8 kilograms per person only a few years ago.[47] Official MOA estimates of China's per capita citrus consumption is 9 kilograms. Most consumers prefer fresh fruit such as fresh oranges, which are considered a high-value consumer item and often given as gifts. For oranges, Chinese consumers prefer navel oranges, followed by Valencias.[48] Citrus consumption is greatest during and just after the domestic citrus harvest, coinciding with certain Chinese holidays and traditional festivals leading up to the Chinese New Year. Lemons are also

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[41] Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China. One such packer-owned demonstration farm spans more than 30 hectares in the Chongqing area.

[42] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China.

[43] Wet markets sell fresh produce and fresh/live meat, poultry, and fish within an open area, often outdoors.

[44] Wu, "The Situation and Outlook of Citrus Processing;" Deng, "China's Import and Export of Citrus Fruit;" China Internet Information Center, "Citrus Fruit Producer." Processed citrus fruit is mostly canned mandarins. Other miscellaneous processed products include tangerine juice, jams, and citrus oils (from peel).

[45] Interview with Chinese government officials, February 21, 2006, Beijing, China.

[46] USDA, FAS, *GAIN Report* No. CH4062; Wu, "The Situation and Outlook of Citrus Processing;" and Murray, "Contenders or Challengers," 3. There are orange juicing plants in Chongqing, Sichuan, and Jiangxi provinces.

[47] USDA, FAS, *GAIN Reports* Nos. CH3132, CH4062 and CH5084.

[48] Hanlon, "Trends in China's Citrus."

consumed fresh, but purchased mostly for use by hotels and restaurants. The domestic market for processed fruit and fruit juice remains limited. Citrus consumption is expected to increase given rising incomes, increasing urbanization, rising demand for fresh fruit, greater health consciousness, improved logistics and retail chains, and expansion plans by international retailers.[49]

Pricing and Marketing

Average annual wholesale prices for oranges and lemons/limes in China have been declining in recent years, but tend to vary widely throughout the year and by region. In 2004-2005, national average wholesale orange prices were $0.60/kg-$0.71/kg; lemon and lime wholesale prices averaged higher at $0.98/kg-$1.08/kg (table 8-2).[50] Prices for lemons and limes are less variable month-to-month, compared to orange prices (table 8-3). Orange prices are highest from June to late October when domestic supplies are low. Prices may also be higher just prior to and during the Chinese New Year, coinciding with higher demand. Prices vary significantly between regions and tend to be higher in the coastal provinces and lower in the west and south western provinces.[51]

Table 8-2 Oranges and lemons: Chinese wholesale prices, 2000-2005 (US dollars/kg)

Item	2000	2001	2002	2003	2004	2005
Oranges	([a])	([a])	0.87	0.72	0.71	0.60
Lemons	([a])	([a])	1.16	0.95	1.08	0.98

Source: Data from China Customs, reported by USDA, FAS, *GAIN Reports* Nos. CH4062 and CH5084. Converted to US dollars per kilogram by USDA.

[a]Not available.

Table 8-3 Oranges and lemons: Chinese monthly wholesale market prices (US dollars/kg)

Item	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Oranges	0.34	0.38	0.42	0.36	0.42	0.58	0.80	0.88	0.94	0.90	0.61	0.45
Lemons	1.07	1.08	1.04	1.14	1.02	1.09	0.87	0.82	0.76	1.02	0.73	0.82

Source: Data from China Customs, reported by USDA, FAS, *GAIN Report* No. CH5084. December data are estimated. Converted to US dollars per kilogram by USDA.

Retail prices for imported citrus can reach as much as twice that of domestically produced fruit, especially during the Chinese off-season, and because consumers perceive imports to be higher quality (based on appearance, color, fruit surface, and flavor).[52] The price difference between domestic and imported citrus has narrowed given the recent availability of higher-quality domestic fruit from some provinces, especially during peak season. Sample in-season retail prices for imported navels are about $1.50/kg while navels from Jiangxi

[49] Monking, *China's Fruit Market Overview*; Rozelle and Huang, "China and the Economic Forces."

[50] USDA, FAS, *GAIN Report* No. CH4062. Reported wholesale price information do not distinguish between imported and locally produced fruit or report differences among major cultivars and varieties, or fruit quality grades. Data are available (in Chinese) for major agricultural goods by individual wholesale markets at *agri.gov.cn/jghq/gp*.

[51] USDA, FAS, *GAIN Report* No. CH4062.

[52] Deng, "China's Import and Export of Citrus Fruit."

province are about $1.34/kg.[53] Retail prices of imported lemons are still about twice that of domestic lemons, due to differences in size, color, and other attributes. Recent retail prices were about $2.96/kg for imported lemons while domestic lemons ranged in price from $0.72/kg for lemons differing from imports in size and color to $1.48/kg for lemons similar to imports but smaller in size.[54]

Imports and Exports

Overall, China is a net-exporter of citrus fruit, mostly attributable to its exports of fresh and canned mandarins. However, China is a net importer of oranges and lemons. Imports as a share of domestic consumption is estimated at under 2 percent for oranges and under 10 percent for lemons (tables 8-4 and 8-5). Although growing, exports still only account for about 1 percent of China's orange production and a negligible share of its lemon production. In 2005, orange exports were valued at $18.5 million, and were shipped mostly to Hong Kong, Vietnam, Malaysia, Russia, and Singapore (table 8-6). Lemon exports are low, valued at under $100,000 in 2005, and were shipped mostly to Japan, Hong Kong, South Korea, and Russia (table 8-7).[55] Exports coincide with China's production period during November to March, peaking in December and January. Import unit values for oranges generally exceed those for exports[56] (tables 8-8 and 8-9). Imports are concentrated during June through September when domestic supplies are low.

Table 8-4 Oranges: Chinese imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	2,635	49	3	2,682	2	([a])
2001	3,598	54	3	3,649	1	([a])
2002	3,600	44	7	3,637	1	([a])
2003	4,036	61	21	4,076	1	1
2004	4,250	52	34	4,267	1	1
2005	4,450	50	55	4,445	1	1

Source: Estimated by U.S. International Trade Commission using Global Trade Atlas trade data and production reported by USDA, FAS, *GAIN Reports* Nos. CH2055, CH3132, CH4062, and CH5084; USDA, FAS; PSD data. 2005 forecast production.

[a]Less than 1 percent.

[53] Interview with foreign-owned retail company representatives, February 28, 2006, Shanghai, China. Converted from a reported price per 500 grams.

[54] Interview with foreign-owned retail company representatives, February 28, 2006, Shanghai, China. Converted from a reported price per 500 grams.

[55] Global Trade Atlas. Data do not distinguish between lemon and lime trade.

[56] High per-unit values for lemon exports signal possible trade data reporting errors.

Table 8-5 Lemons: Chinese imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	50	5	([a])	55	9	([b])
2001	60	5	0.1	65	8	([b])
2002	70	4	0.1	74	5	([b])
2003	80	5	([a])	85	6	([b])
2004	90	7	0.3	96	7	([b])
2005	100	5	0.1	105	5	([b])

Source: Estimated by U.S. International Trade Commission using Global Trade Atlas trade data and production reported by USDA, FAS, *GAIN Report* No. CH3132. Because of limited information on lemon production, assumes production increases from 50,000 mt to 100,000 mt over the period, based on available information.

[a]Less than 50 mt.
[b]Less than 1 percent.

Table 8-6 Fresh oranges: Chinese exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Hong Kong	1,690	2,152	5,747	11,848	21,974	24,422
Vietnam	198	156	30	3,606	4,967	14,734
Malaysia	60	81	177	488	1,355	4,377
Russia	66	77	83	413	2,193	3,817
Singapore	188	567	247	1,894	668	1,560
Other	326	93	639	2,373	3,246	6,416
Total	2,528	3,126	6,923	20,622	34,403	55,326
	Value (1,000 dollars)					
Hong Kong	230	280	2,322	4,478	7,958	7,874
Vietnam	44	24	8	854	1,077	3,269
Malaysia	8	7	53	146	564	2,509
Russia	17	13	14	117	723	1,251
Singapore	46	128	51	972	380	1,049
Other	64	34	226	1,011	1,741	2,587
Total	409	486	2,674	7,578	12,443	18,539
	Unit value (dollars per metric ton)					
Hong Kong	136	130	404	378	362	322
Vietnam	222	154	267	237	217	222
Malaysia	133	86	299	299	416	573
Russia	258	169	169	283	330	328
Singapore	245	226	206	513	569	672
Other	196	366	354	426	536	403

Source: Global Trade Atlas. As reported by China Customs. May not agree with other compiled trade data sources.

Table 8-7 Fresh lemons/limes: Chinese exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Japan	0	0	0	0	0	1
Hong Kong	2	23	4	2	9	64
Korea South	0	0	0	0	1	3
Russia	0	89	10	15	244	16
Macau	0	0	0	0	0	1
Other	0	8	37	24	21	0
Total	2	120	51	42	274	85
	Value (1,000 dollars)					
Japan	0	0	0	0	0	60
Hong Kong	2	2	1	1	1	8
Korea South	0	0	0	0	2	6
Russia	0	32	4	3	96	6
Macau	0	0	0	0	0	1
Other	0	10	14	7	5	0
Total	2	44	19	11	105	80
	Unit value (dollars per metric ton)					
Japan	([a])	([a])	([a])	([a])	6,000	59,779
Hong Kong	755	87	227	439	129	128
Korea South	([a])	([a])	([a])	([a])	2,220	2,049
Russia	([a])	361	419	186	395	353
Macau	([a])	([a])	([a])	([a])	([a])	1,000
Other	([a])	1264	369	291	256	([a])

Source: Global Trade Atlas. As reported by China Customs. High per-unit values for some countries signal possible trade data reporting errors. May not agree with other compiled trade data sources.

[a]Not available.

Table 8-8 Fresh oranges: Chinese imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	30,960	34,231	20,228	33,808	30,958	31,467
South Africa	482	0	3,108	3,900	3,690	10,976
New Zealand	17,571	20,020	20,770	22,677	16,447	7,299
Argentina	0	0	0	0	0	270
Uruguay	0	0	0	70	366	175
Other	331	17	73	109	165	161
Total	49,343	54,268	44,178	60,565	51,625	50,348
	Value (1,000 dollars)					
United States	14,283	16,666	10,202	20,552	22,111	22,388
South Africa	260	0	1,359	2,258	2,628	7,252
New Zealand	8,293	8,713	10,950	15,764	11,890	5,150
Argentina	0	0	0	0	0	205
Uruguay	0	0	0	45	256	126
Other	184	6	34	50	109	116
Total	23,020	25,385	22,545	38,669	36,994	35,237
	Unit value (dollars per metric ton)					
United States	461	487	504	608	714	711
South Africa	539	([a])	437	579	712	661
New Zealand	472	435	527	695	723	706
Argentina	([a])	([a])	([a])	([a])	([a])	759
Uruguay	([a])	([a])	([a])	639	700	720
Other	556	351	468	458	662	720

Source: Global Trade Atlas. As reported by China Customs. May not agree with other compiled trade data sources.

[a]Not available.

Table 8-9 Fresh lemons/limes: Chinese imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	2,671	3,129	2,247	1,913	4,033	3,522
New Zealand	1,975	1,740	1,560	2,987	1,938	1,403
South Africa	24	0	0	0	119	190
Thailand	163	155	72	54	156	87
Argentina	0	0	0	0	0	47
Other	4	17	34	2	284	26
Total	4,837	5,040	3,914	4,956	6,530	5,275
	Value (1,000 dollars)					
United States	1,351	1,468	1,126	1,391	3,549	3,183
New Zealand	898	802	650	2,315	1,762	1,293
South Africa	13	0	0	0	98	180
Thailand	76	101	50	38	79	52
Argentina	0	0	0	0	217	44
Other	3	7	14	3	23	88
Total	2,341	2,378	1,840	3,747	5,728	4,840
	Unit value (dollars per metric ton)					
United States	506	469	501	727	880	904
New Zealand	455	461	417	775	909	922
South Africa	553	([a])	([a])	([a])	827	947
Thailand	467	652	693	704	507	598
Argentina	([a])	([a])	([a])	([a])	([a])	936
Other	686	423	409	1,974	81	3,385

Source: Global Trade Atlas. As reported by China Customs. High per-unit values for some countries signal possible trade data reporting errors. May not agree with other compiled trade data sources.

[a]Not available.

Imports to mainland China are both direct and indirect through unofficial "gray" channels or transshipments via Hong Kong.[57] The size of indirect imports via Hong Kong often exceeds that of direct imports to mainland China, particularly for oranges. More conservative estimates for oranges and lemons indicate that indirect imports account for roughly 50 percent of direct imports.[58] As a result, China's exact level of imports are not known since unofficial imports are omitted from official import statistics. Trade data summarized here show official import data for mainland China only and are therefore likely understated.

There are several reasons for the larger volume of transshipments. Some exporters simply prefer operating through businesses in Hong Kong.[59] There are also no duties on imports of agricultural commodities, including citrus, into Hong Kong and shipping via Hong Kong is

[57] USDA, FAS, *GAIN Report* No. CH5617, Gale, "China at a Glance," 52; Hanlon, "China's Citrus and Trade;" USDA, FAS, *World Fresh Citrus Situation*; Huang and Gale, "China's Rising Fruit and Vegetable Exports;" Hongqi and Wahl, "Recent Developments;" Carter and Li, "Economic Reform;" USTR, *National Trade Estimate Report*. Hanlon reports that unofficial shipments from other countries also contribute to China's unofficial imports.

[58] USDA, FAS, *GAIN Report* No. CH5617*;* Hanlon, "China's Citrus and Trade." Based on 2000 volume data. In 1998, an estimated 90 percent of Hong Kong's orange imports were re-exported to mainland China. In 2004, indirect imports of oranges from Hong Kong were about $14 million, compared to total direct imports of about $37 million, or about 40 percent (See: USDA, FAS, *GAIN Report* No. CH5811).

[59] Hanlon, "China's Citrus and Trade;" USDA, FAS, *GAIN Report* No. CH5617.

reportedly a way to avoid paying customs duties and VAT.[60] Tariffs on fruit imports to China have been reduced since its accession to the WTO in 2001; the effective rate for fresh oranges and lemons imports is 25.4 percent, which includes an 11 percent tariff and a 13 percent value-added tax (VAT).[61]

China has citrus import protocols with the United States, New Zealand, Thailand, South Africa, Uruguay, and Australia.[62] China does not currently have a protocol with Spain, but recently signed an agreement with Spain to import an estimated $780 million in citrus products over the next 10 years.[63] China's citrus exports will likely benefit from its proximity to important Asian import markets and also duty-free access to most markets under the recently enacted China-ASEAN free trade agreement.[64] Recent export gains for Chinese citrus exports have included inroads into some of the U.S.' traditional export markets in Asia, including Japan, Taiwan, South Korea, Hong Kong, Singapore, and Malaysia.[65] USDA reports that China's quarantine authorities (Administration for Quality Supervision, Inspection, and Quarantine or AQSIQ) are pushing for Chinese citrus access to the U.S. market.[66] However, future export growth is likely to be limited by China's large and growing demand in its own domestic market.[67]

Competitive Factors

China's main competitive advantage in orange and lemon production is its low farm-level cost of production. This is mostly attributable to its labor-intensive production from small-scale, low-technology operations, using little or no mechanized inputs. However, poor post-harvest conditions, high farm-to-market costs, and continued high fruit spoilage rates because of China's inadequate transportation and storage infrastructure may effectively offset much of the advantage gained from low farm costs of production. China's ability to expand its citrus markets in the near-term is also limited by low quality domestic production, poor marketing efforts, lack of consistent standards, and high pesticide and agrochemical residues on fruit. The scarcity of arable land and ongoing competition for land in China further limits the ability of its farmers to increase fruit production in the long-term. Nevertheless, in recent years, some segments of China's orange and lemon sectors have become more modernized and there has been increased investment and research to address China's persistent structural weaknesses in these sectors. There has been increased availability of farmer extension services and guidance to improve production practices and to extend the production season and expand China's marketable fruit supplies. Also, some newer, large-scale operations have had considerable success packing high-quality fresh fruit

[60] However, shipments via Hong Kong tend to be costly because of the additional shipping and handling costs. Interview with U.S. citrus industry officials, February 27, 2006, Shanghai, China.

[61] VAT is assessed on the value added in all goods during their manufacture and sales process from raw material until it reaches the consumer. VAT is reimbursed when goods are re-exported. Tariffs on processed fruits are 17 percent.

[62] USDA, *GAIN Reports* Nos. CH4062 and AS5042. China's protocol with the United States permits imports from several counties in Arizona, California, Florida, and Texas.

[63] "Hu in Spain," *Asia News*.

[64] Duty-free trade of fresh produce is effective January 1, 2006 under the agreement.

[65] Interview with U.S. citrus industry representative, January 6, 2006, Washington, DC.; Nassif, "China: A Country of Contrasts," 12-25.

[66] USDA, FAS, *GAIN Report* No. CH4062. As of December 2004, To date, USDA's APHIS has not yet scheduled a pest risk assessment.

[67] Interview with Chinese government officials, February 21, 2006, Beijing, China; House, "Big Picture."

for the commercial market and are expanding the marketing opportunities for domestically-grown citrus fruit. Additional information is provided in the following subsections.

Natural Endowments

China's agricultural production extends across a series of micro-climates, including tropical, subtropical and temperate zones, each suitable for growing a variety of crops.[68] However, agriculture production is often subject to severe weather conditions and natural disasters, including floods and drought.[69] In the southern regions where most new citrus production is located, production conditions are characterized by warm climates, sufficient water supplies, and hilly and sloped terrain that is not suitable for production of other types of crops. Reported weather-related constraints affecting citrus production include occasional freezing temperatures and inadequate sunshine (Sichuan), dry summers and wet fall/winter (Sichuan, Chongqing), high temperatures (Guangdong), flood conditions (coastal areas), and disease (southern Hunan and northern Guangxi).[70] Chinese growers are able to take limited measures to protect against these weather-related conditions.

Irrigated acreage is growing and often used to more evenly distribute available water supplies. Irrigation systems usually consist of drainage canals or pipes with a pond or lagoon system; few operations use mechanized irrigation technologies such as drip or sprinkler irrigation.[71] In the more southern citrus growing areas water is relatively abundant, and farmers have access to water at low or negligible prices.[72] Farm costs for water and irrigation are low, averaging under $10 per hectare annually.[73] Water fees for some smaller orchards, excluding irrigation system costs, may be as low as about $4 per orchard per year.[74] Soil in the main orange and lemon growing regions is generally a peat-sand mix with low organic matter that requires conditioning with supplements. Inter-planting broad beans between trees is often recommended as a soil supplement and nitrogen-fixer, along with other forms of fertilizer and organic matter.[75]

Pests and Diseases

Citrus farmers face difficulties controlling pests and diseases in some areas. Diseases most affecting China's major orange growing areas include greening disease, citrus tatterleaf, citrus exocortis, and satsuma dwarf virus, as well as various pests such as red mites and pathogens.[76] Tristeza is an increasing concern now that more oranges are being grown, and growers are turning to a trifoliate rootstock that is resistant to the disease. Lemon production is mostly affected by phytophtorin foot rot (a lemon gummosis fungus), brown rot and

[68] Monking, "China's Fruit Market Overview;" Hongqi and Wahl, "Recent Developments."
[69] Drought and water shortages mostly affect agricultural production in China's northern provinces.
[70] Hongqi and Wahl, "Recent Developments;" USDA, FAS, *GAIN Report* No. CH4062; Simpson, "Trio of Typhoons."
[71] Interview with Chinese government officials, February 23, 2006, Chongqing, China.
[72] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China; Lohmar and Wang, "Will Water Scarcity Affect Agricultural Production in China?" Gale, "China at a Glance."
[73] PRC, NDRC, *National Production Costs and Returns of Agricultural Commodities*, 317-322.
[74] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China.
[75] Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China; Chapple, "Farm-level Picture."
[76] Interview with Chinese government officials, February 23, 2006, Chongqing, China.

various pests such as Asian citrus root-knot nematods and mites.[77] Citrus canker remains a problem in coastal areas, but has been largely eradicated in the inland growing areas since 1987, where canker is easier to control because of a lower incidence of freezing temperatures and strong winds.[78] Pests and diseases that are less of a problem in the inland provinces include citrus variegated chlorosis, citrus (rhabdovirus) leprosis, citrus sudden death, Witch's Broom Disease of Lime, and citrus psorosis-associated virus.

There is limited use of disease-free seedlings and cultivars in Chinese citrus production, and pest management and control practices mostly consist of application of pesticides and chemicals.[79] Costs of pesticide application are high, averaging about $500 per hectare per year or about 15 percent of average farm-level costs.[80] Combined costs for fertilizer and chemicals in Chinese fruit production are generally higher than in other countries, because Chinese farmers often try to boost productivity by increasing their use.[81] However, pesticides are often applied ineffectively.[82] In an effort to reduce pesticide use and agro-chemical residues on fruit, new farming practices and standards are being encouraged under the MOA's "Wholesome Food Action Plan" launched in 2002.[83] The government is also providing certification for higher production standards, including "green foods" and "organic foods."[84] These recommended practices and standards have yet to be widely adopted in the field because of general reluctance to alter long-standing production practices.[85]

Seasonality

China's orange and lemon harvest is concentrated during the October-December time-frame. Currently, about 20 percent of production are early-maturing varieties and 5 percent are late-maturing varieties. The bulk of production (75 percent) is harvested mid-season, mostly in November and December.[86] Domestic fresh oranges and lemons are rarely available April to August because of a lack of cold storage facilities.[87] However, there are ongoing efforts to extend the production period through additional plantings of late-maturing navel varieties that are beginning to push production past March-April.[88] China's marketing season by variety for all domestically-produced oranges and lemons is shown in the following tabulation:

[77] Ibid.

[78] Ibid. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China.

[79] Ibid.

[80] PRC, NDRC, *National Production Costs and Returns of Agricultural Commodities*, 317-322.

[81] Gale, "China at a Glance," 8; Hongqi and Wahl, "Recent Developments;" OECD, *Review of Agricultural Policies*, 5.

[82] Chapple, "Farm-level Picture." Chapple cites inappropriate types of pesticides used, little understanding of anti-resistence strategy and harvest intervals, inappropriate mixing of pesticide types, and inability to follow directions on recommended use.

[83] USDA, FAS, *GAIN Report* No. CH4062. The program encourages "ecological" orchard production under limited use of pesticides and fertilizers, usually through integrated livestock production (use of manure as fertilizer) and also the adoption of bio-chemicals/insects to control pests and diseases.

[84] USDA, FAS, *GAIN Report* No. CH5084. Orchards are certified by the Green Food Development Center.

[85] Interview with Chinese government officials, February 23, 2006, Chongqing, China.

[86] Interview with Chinese government officials, February 21 and 23, 2006, Beijing, and Chongqing, China.

[87] USDA, FAS, *GAIN Report* No. CH4062.

[88] Interview with Chinese government officials, February 23, 2006, Chongqing, China.

Oranges and lemons: Chinese marketing seasons by variety	
Variety	Marketing season
Oranges:	
Early-maturing	September-October
Middle-maturing	November-December
Late-maturing	January-June
Navel oranges	November-May
Jincheng	October-February
Valencias	March-June
Blood oranges	January-February
Other local varieties	October-November
Lemons	August-December
Source: Chinese government and other citrus industry officials, interview by Commission staff, February 23-27, 2006.	

Labor

Historically, China's low cost abundant labor has contributed to its comparative advantage in labor-intensive agriculture production, such as horticulture.[89] More than 350 million people are employed in the agriculture sector, which accounts for 49 percent of the labor force, and average wage rates for agriculture are reportedly about one-tenth U.S. rates.[90] At smaller orchards, the grower-owner and other family members generally can do all the necessary work themselves, with no additional hired labor. However, hired labor may be used for pruning, thinning, and harvesting. During the late 1990s, official estimates of labor rates for orange production ranged from about \$1-\$2 per day depending on the province.[91] Labor costs are still low compared with that of other countries. Wages have been increasing and currently average between \$2-\$4 per day per worker,[92] but can vary depending on the task performed. Some reported daily per-worker costs are as follows: \$4-\$6 per day (picking); \$6-\$7 per day (pruning, trimming); \$2-\$3 per day (applying chemicals).[93] Wages may also vary according to labor availability at different times of the year. Despite overall low labor costs, hired labor is the largest cost component at citrus orchards, accounting for more than one-third of all reported farm-level costs.

Land

Despite its large land mass, only about 15 percent of China's land is reported to be arable, and much of this land is already in production.[94] In recent years, there has been increased competition for land from other industries and ongoing urban, commercial, and residential

[89] Quan and Lui, "An Analysis of Current Problems;" Huang and Rozelle, "China's Accession to WTO," 35; OECD, *Review of Agricultural Policies*, 3.
[90] ILO data (1969-2004).
[91] PRC, NDPC, Cost and Returns data. Data show costs lower in Chongqing and higher in Guangdong.
[92] Interview with Chinese government officials, February 21, 2006, Beijing, China; Rozelle and Huang, "China and the Economic Forces;" USDA, FAS, *GAIN Report* No. CH4062.
[93] Interview with Chinese government officials, February 21, 2006, Beijing, China. Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China.
[94] CIA, *World Factbook*. USDA notes that exactly how much land China uses for agriculture is unclear (see: Lohmar, "Labor, Land, and Credit.")

development.[95] Limited land availability restricts the potential to expand cultivated land and plant new trees, often requiring that farmers switch from one crop to another.[96] Farmers also try to raise production by planting trees close together, given that there is usually only one harvest cycle per year. An estimated 18 percent of China's farmland is dedicated to all horticulture production, including citrus.[97]

Land-tenure insecurity is another limiting factor in the development of China's agricultural sectors. In China, farmers do not own their land, and land may not be bought or sold. Instead, land is nominally owned by a village, often 200-300 households, or a collective group of 15-40 households. The right to use farmland collectively-owned by villages is allocated to the household by local leaders[98] under renewable contracts valid for up to 30 years.[99] Households can use, sub-lease and transfer land, and land may be leased from the state or rural county village.[100] In practice, however, land rentals are relatively uncommon and mostly informal, short-term, or between relatives.[101] Although leasing land has become more common, costs can be high. Estimates range from about \$360-\$1,400/ha per year.[102] Rents are typically lower for a Chinese company than rents paid by a foreign-owned entity.[103] Recently farmers have begun to demand independent land transfer rights, and new land tenure arrangements are being considered, including reforms to protect landholders against confiscation and abuse.[104]

Yields

Current orange and lemon yields are about 8-9 mt per hectare. Actual yields may vary widely given the continued practice of high density tree-plantings, which may contribute to high yields. However, productivity is generally low and annual production is usually based on a single harvest, contributing to lower overall yields per unit area of land. MOA officials report that the national average density rate is 900 trees per hectare, although tree density in some old groves can range from 1,200-1,600 trees per hectare.[105] Lower tree densities (550-675 trees per hectare) are now being encouraged to raise fruit quality and maintain soil

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[95] Quan and Lui, "An Analysis of Current Problems;" Nassif, "China: A Country of Contrasts," 12-25; Chapple, "Farm-level Picture."

[96] USDA, FAS, *GAIN Report* No. CH4062.

[97] House, "Big Picture."

[98] Lohmar, "Land Tenure Insecurity;" Lohmar, "Labor, Land, and Credit;" Huang and Rozelle, "China's Accession to WTO." Land-use authority is often spread across various levels of local government.

[99] Quan and Lui, "An Analysis of Current Problems;" "A little less gloom," *The Economist*, 42; Lohmar, "Changes in Labor, Land, and Credit." The 1998 Land Management Law mandated use rights for 30 years. Previously, land could only be contracted for 5- to 10-year periods, which did not allow orchards to recoup investment in tree plantings.

[100] OECD, *Review of Agricultural Policies*; Hongqi and Wahl, "Recent Developments."

[101] OECD, *Review of Agricultural Policies*; Gale, "China at a Glance;" Lohmar, "Changes in Labor, Land, and Credit."

[102] Huang and Gale, "China's Rising Fruit and Vegetable Exports;" Qi, "Marketing and Distribution;" Chapple, "Farm-level Picture." Interview with Chinese government officials, February 21, 2006, Beijing, China. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China.

[103] Huang and Gale, "China's Rising Fruit and Vegetable Exports." USDA cites a range of \$350-\$600 per acre for a foreign firm compared to \$220 per acre for a Chinese firm.

[104] Interview with U.S. government officials, February 27, 2006, Shanghai, China; Lohmar, "Changes in Labor, Land, and Credit."

[105] USDA, FAS, *GAIN Report* No. CH4062. The continued practice of high density tree-plantings results in a wide range in actual yields compared to reported national average statistics across all of China's fruit sectors. Historically, high-density planting was encouraged by the government to boost production.

productivity over time.[106] However, most old orchards and some new orchards are still planting trees close together to maximize annual revenues, especially during the orchard development period and during the first few harvests.[107] Often other commercial crops, such as soybeans, nuts or vegetables, are interplanted between the trees to provide income to farmers until the trees reach maturity, and the other crops are then removed.[108]

By most measures, China's productivity and efficiency lag behind more developed countries. On average, Chinese growers use roughly 300 workers per hectare of farmland; however, output per worker remains low by international standards.[109] China also lags in terms of its technological efficiency, given that most production is low-technology, using relatively few tractors and other mechanical inputs.[110] Other factors contributing to low yields include disease and pest problems, poor variety and rootstock selection, lack of proper irrigation and management, inadequate pruning, and susceptibility to extreme weather events. China's chemical-intensive production may further reduce land productivity over time, as well as lower the potential marketability of fruit given rising concerns about pesticides and agrochemical residues.[111]

Production Technology

As previously mentioned, production is labor-intensive, with limited use of machinery and available technology. Available orchard management standards are relatively low and outdated.[112] For the majority of small-scale, low-technology citrus orchards, there are no uniform standards to establish and manage an orchard, technology adoption is slow, and modern machinery is too large and expensive.[113] Although Chinese farmers may lack modern machinery and equipment, they reportedly have horticultural expertise, especially with respect to seedling and dwarfing rootstocks, planting conditions, and plant management.[114] Pre-harvest techniques at some Chinese citrus orchards are relatively close to Western standards regarding the use of technologies, such as new varieties, grafting, pest and insect control, and pruning, thinning, tree-training, and orchard management. Government agencies may also influence orchard management through technical assistance regarding orchard design and selection of varieties from professional extension services and university personnel.[115]

Despite good quality of harvested fruit, poor post-harvest conditions at most orchards causes much fruit to deteriorate quickly during handling and shipment. Poor post-harvest conditions are exacerbated by poor or no commercial treatment of fruit (e.g., grading, washing, waxing, and packaging) and by an underdeveloped infrastructure. Infrastructure constraints include: limited post-harvest technologies and management; limited warehousing and cold storage capacity; limited use of packaging and processing technologies; inadequate port facilities;

[106] Interview with Chinese government officials, February 23, 2006, Chongqing, China. Trees spaced according to a 4x3m, a 4x4m, or a 3-4x5m formation (or 5x4m to 5x3.5m in more hilly areas).

[107] Ibid. Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China.

[108] USDA, *GAIN Report* No. CH3132; Warner, "This is Tiananmen Square."

[109] OECD, *Review of Agricultural Policies*, 3.

[110] Gale, "China at a Glance," 8.

[111] Huang and Gale, "China's Rising Fruit and Vegetable Exports," 17.

[112] Hongqi and Wahl, "Recent Developments."

[113] Warner, "A Different Perspective."

[114] Warner, "Pedestrian Orchards."

[115] Hongqi and Wahl, "Recent Developments."

and poor transportation and distribution systems, especially in rural areas.[116] As a result, China's fruit industries face severe spoilage problems, estimated at 15-40 percent of production.[117] Marketing of domestically produced citrus is also hampered by poor appearance, low-quality packaging, and variable eating quality. These factors contribute to inefficiencies in China's marketing and distribution system for fruit, and contribute to high marketing costs for fresh fruit.[118]

Problems due to lack of overall storage capacity and cold storage facilities occur throughout the marketing and distribution chain.[119] Most farmers still rely on traditional storage methods, which often involves storage of fruit in the grower's home, in self-built storage facilities, or in underground basements. Growers may also simply leave fruit on the tree unpicked for as long as possible, often until late January or early February when prices are higher. After harvest, some growers may do simple hand or machine grading, based on size and appearance. Washing and waxing are rare.[120] Most growers place citrus in individual plastic bags to preserve moisture prior to storage. Some use other forms of pre-treatment, such as spraying fruit with fungicides, which can preserve fruit for 1-3 months after harvest.[121]

Total available cold storage servicing all of China's agricultural sectors is estimated at 5 percent of production.[122] Local governments and industry have built some small fruit storage facilities with an estimated national storage capacity of about 12 million mt, or less than 20 percent of the total fruit production.[123] To date, there has been limited private investment in cold storage in the citrus–producing regions. There are no known commercial-controlled atmosphere facilities.[124] Refrigerated trucks, usually consisting of trucks with ice, transport only about 10 percent of all agriculture production in China.[125] Damage during transportation reportedly accounts for much of the spoilage loss of China's horticulture production.

Government Policies and Support

At the national level, MOA has actively sought to expand China's fruit industries by providing guidance and recommendations to provincial and local governments in order to expand acreage, production and consumer demand.[126] MOA's current national plan for citrus establishes goals to raise production and yields of high-quality varieties. The plan also seeks to extend the supply season by encouraging investment in early- and late-maturing

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[116] Hongqi and Wahl, "Recent Developments;" Monking, "China's Fruit Market Overview."

[117] USDA, FAS, *GAIN Report* No. CH5617; Hongqi and Wahl, "Recent Developments;" Hanlon, "China's Citrus and Trade." Monking, "China's Fruit Market Overview." Interview with U.S. citrus industry officials, February 27, 2006, Shanghai, China.

[118] Interview with U.S. government officials, February 27, 2006, Shanghai, China; Huang and Gale, "China's Rising Fruit and Vegetable Exports," 14

[119] USDA, FAS, *GAIN Report* No. CH5617.

[120] USDA, FAS, *GAIN Report* No. CH4062.

[121] Interview with U.S. government officials, February 27, 2006, Shanghai, China; USDA, FAS, *GAIN Reports* Nos. CH3132 and CH4062.

[122] Warner, "A Different Perspective."

[123] USDA, FAS, *GAIN Report* No. CH4062; Warner, "A Different Perspective." USDA reports that available modern cold storage facilities mostly stock deciduous fruit.

[124] Controlled atmosphere storage maintains a constant humidity level.

[125] Qi, "Marketing and Distribution."

[126] Interview with Chinese government officials, February 21, 2006, Beijing, China.

varieties.[127] For oranges, the plan identifies development of key production and planting areas, and includes a long-term plan to encourage construction of integrated orange groves in some areas.[128] The government is helping farmers obtain specific varieties, adopt better farming practices with the assistance of research institutes and agricultural extension services, and establish a market information system. The government is also trying to attract large agro-businesses to invest in the marketing and processing sectors.[129] Local governments are encouraged to adopt favorable land use policies and promote plantings in identified advantageous regions with specific varieties for fresh markets or processing.[130]

China's national citrus plan does not provide government funding; however, preferential policies and support may exist at the local government level.[131] Some orchards are reported to have received payments covering a portion of their start-up costs, while some small-scale packers have reported benefitting from programs that provide a production subsidy or an income guarantee based on unsold proceeds.[132] For the most part, fruit production in China is not directly subsidized, and overall support or protection of China's fresh fruit industry is estimated to be low.[133] A recent OECD report estimates a low-level of support for fruit compared to that for other Chinese agriculture products and also compared to other countries.[134] Moreover, there is minimal regulation and government intervention affecting China's agriculture production and marketing sectors.[135]

China's broader national agriculture policy is guided by its annual "#1 Document," which generally outlines policies intended to ensure food security and improve rural incomes.[136] Recent initiatives included the phase-out of the long-standing agricultural tax on farmers[137] and increasing investment in infrastructure and social programs for China's rural areas, such as health care and education.[138] Other favorable broad-based government policies include: waiving provincial highway charges for trucks transporting fresh farm produce; establishing

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[127] USDA, FAS, *GAIN Report* No. CH3132. The desired arrival structure for citrus is 20 percent early and 40 percent each for middle and late seasons arrivals.

[128] USDA, FAS, *GAIN Report* Nos. CH3132 and CH4062. The plan also identifies areas in Zhejiang, Fujian, and Guangdong provinces to further develop fresh and canned mandarins for export.

[129] USDA, FAS, *GAIN Report* No. CH4062.

[130] Interview with Chinese government officials, February 22, 2006, Beijing, China; USDA, FAS, *GAIN Report* No. CH4062. Policy as outlined in MOA's strategy to "plant suitable varieties in suitable areas."

[131] Interview with Chinese government officials, February 21 and 22, 2006, Beijing, China. Interview with Chinese citrus industry officials, February 27, 2006, Shanghai, China.

[132] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China. Interviews with Chinese citrus industry officials, February 26, 2006, Sichuan, China.

[133] Huang, Rozelle, and Min, "Distortions to Incentives," 4.

[134] OECD, *Review of Agricultural Policies.* Measured by PSE (Producer Subsidy Equivalents).

[135] Rozelle and Huang, "China and the Economic Forces;" Hongqi and Wahl, "Recent Developments;" Quan, "An Analysis of Current Problems." In contrast, grain procurement, distribution and trade is controlled through state-owned storage and distribution companies. Controls may exist in some agricultural input markets, such as chemical fertilizers and pesticides, which have historically been controlled by state-owned enterprises (SOEs) and government agencies (see: Gale and Lohmar, "China: En Route," 34; Quan and Lui, "An Analysis of Current Problems").

[136] Interview with Chinese government officials, February 22, 2006, Beijing, China. Documents were published in 2004, 2005, and 2006.

[137] As of 2004, 22 of 31 provinces had eliminated the farm tax. Prior to these reforms Chinese farmers were typically assessed an agricultural tax according to the normal productive value of their land. USDA estimates the cost of the 5-year phase-out of the farm tax at \$5-\$7 billion and it is expected to stimulate planting of specialty crops. See: Gale, Lohmar, and Tuan, "China's New Farm Subsidies," 3.

[138] "A little less gloom," *The Economist*, 42; Gale, Lohmar, and Tuan, "New Farm Subsidies." The policy also introduced, for the first time, direct subsidies to grain farmers including subsidies for seed and machinery purchases.

information services (prices, market conditions, etc.); supporting the establishment of agricultural cooperatives; sponsoring trade shows; providing low-interest or no-interest loans in some low-income areas; limiting increases in input prices for farmers; and providing favorable tax treatment on exported horticulture products.[139]

Nearly every provincial county in China has agriculture extension offices that provide technical assistance and training for fruit farmers. China's citrus sectors are supported through the efforts of the government-supported Citrus Research Institute (CRI) located in Chongqing.[140] Agribusiness firms and other privately-owned companies also provide a wide range of extension services to farmers, including new technologies and information through demonstration projects, improved varieties and nursery operations, market information, assistance with access to inputs and financing, limited funding, and opportunities for vertical integration and commercialization.[141]

Business Climate and Investment

Historically, there has been limited capital investment in China's agricultural sector because of natural risks, low profitability, and uncertainty given government policies, high taxes, and land tenure insecurity.[142] Following rural reforms of the late 1970s, agribusiness firms have emerged and are transforming Chinese agriculture, contributing to its rapid growth. China's accession to the WTO in 2001 has resulted in wide-ranging commitments to further liberalize its markets and business sectors. Import tariffs on citrus products have been reduced and there are significant and ongoing reforms of China's economy, including its rural labor, land, credit, and foreign investment markets.[143] These reforms are helping to introduce new technologies and cultural practices, further fund research and development, and provide additional capital to help modernize China's agricultural sectors. The private sector now accounts for a larger share of China's economy,[144] although the government still controls certain strategic sectors, such as the grains sector.

China's formal credit institutions are mostly state-owned or state-supervised institutions that historically have not favored small loans to farmers.[145] As a result, China's farming sector is still characterized by limited access to rural credit and by low levels of capital investment.

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[139] USDA, FAS, *GAIN Report* No. CH5084; Rozelle and Huang, "China and the Economic Forces;" Hongqi and Wahl, "Recent Developments;" Gale, Lohmar, and Tuan, "China's New Farm Subsidies," 14.

[140] USDA, FAS, *GAIN Report* No. CH3132. CRI is responsible for research on tree breeding and grafting, rootstocks, tissue culturing, citrus varieties, and also disease. CRI facilities include the National Citrus Germplasm Bank, a Citrus Planting Technology Center, a citrus Storage and Processing Center, a Virus Exclusion Center, and the MOA Citrus Quality Inspection Center. Some government-supported research systems and information services support are weak, and reportedly in need of reform to address concerns about duplication efforts, inefficiency, over-staffing, and development of inappropriate technologies. See: USDA, FAS, *GAIN Report* No. CH4062; Huang and Rozelle, "China's Accession to WTO," 7.

[141] Zhang, Fan, and Qian. "Agribusiness Firms," 1; Huang and Gale, "China's Rising Fruit and Vegetable Exports," 17; Fuller, "China's Livestock Industry." Interview with Chinese government officials, February 22, 2006, Beijing, China.

[142] Zhang, Fan, and Qian. "Agribusiness Firms," 1; Quan and Lui, "An Analysis of Current Problems."

[143] Lohmar, "Changes in Labor, Land, and Credit."

[144] McGregor, "Private Sector;" "China's Prospects," *Taipei Times*, China's private sector is reported to account for nearly three-fourths of its economy.

[145] Lohmar, "Changes in Labor, Land, and Credit;" Gale and Collender, "New Directions," 12.

Most growers are often unable to acquire development loans and assistance.[146] Because farm households do not own land, they are unable to use land as collateral in the credit market. Farmers are also discouraged from applying for loans because of high transaction costs associated with China's credit institutions.[147] Growers often rely on self-financing or income from one season to the next.

As part of China's ongoing policy guidance to foster rural economic development, its financial institutions have significantly increased lending to farmers and agribusinesses. More small loans are now available to farm households through China's large system of more than 30,000 rural credit co-operations (RCCs).[148] In addition to an increase in conventional loans to farmers, China has also expanded its "micro-loan" and joint-guarantee lending programs. Chinese financial institutions also provide loans to agriculture processing companies and for rural infrastructure projects.[149] Farm loans are usually less than Rmb 10,000 (about $1,200).[150] Interest rates are set by the central bank and reportedly are often below market-clearing rates,[151] sometimes as low as one percent or less.[152]

Foreign investment and joint ventures are increasing in some of China's fruit and vegetable sectors, led by investment from Japan, Korea, and Taiwan,[153] although there is currently little foreign investment in the orange and lemon industry.[154] There are recent reports that foreign firms from Hong Kong and Macau may be investing in commercial citrus packing facilities in some of the major growing provinces of Sichuan, Chongqing, Jiangxi, and Hainan.[155] Some planned joint ventures in the citrus sector have fallen through.[156] There are no known U.S. citrus companies that have invested in joint ventures or partnerships with Chinese interests.[157] Joint ventures and partnerships between foreign companies and Chinese partners report the following difficulties with investing in China's fruit sectors: uncertainty because of China's hierarchical system and government influence on business decisions; conflicting management objectives between western and Chinese partners; difficulties transferring

[146] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China; USDA, FAS, *GAIN Reports* Nos. CH3132 and CH4062; Access to credit allows farmers to invest in fixed, long-term inputs and buy agricultural inputs such as seeds, fertilizers, pesticides, and other inputs.

[147] Lohmar, "Changes in Labor, Land, and Credit."

[148] Gale, Lohmar, and Tuan, "China's New Farm Subsidies," 8.

[149] Gale and Collender, "New Directions," 12; Gale, Lohmar, and Tuan, "New Farm Subsidies," 8.

[150] USDA, FAS, *GAIN Report* No. CH4062. Other reports by USDA indicate that most loans are short-term (3-6 months) and under $25,000 each, and used for input purchases and modest investments such as well-digging, livestock and fertilizer purchases, planting orchards, and greenhouse construction.

[151] Gale and Collender, "New Directions," 12; Gale, Lohmar, and Tuan, "China's New Farm Subsidies," 14.

[152] Rozelle and Huang, "China and the Economic Forces;" Foster, Statement before U.S.-China Commission; Hongqi and Wahl, "Recent Developments."

[153] Nassif, "China: A Country of Contrasts," 12-25; House, "Big Picture;" USDA, ERS, "China Increases Export of Fresh and Frozen Vegetables."

[154] Interview with Chinese government officials, February 21, 2006, Beijing, China. Interview with Chinese citrus industry officials, February 27, 2006, Shanghai, China.

[155] Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China. Interview with Chinese citrus industry officials, February 27, 2006, Shanghai, China.

[156] Hanlon, "China's Citrus and Trade."

[157] Interview with U.S. citrus industry representative, January 6, 2006, Washington DC.

money out of China; sensitivities over land-ownership; and non-transparent and inconsistently enforced laws and regulatory requirements affecting foreign firms.[158]

Trade-Related Issues

China's biggest obstacle to competing on the world market is its difficulty meeting established food safety and hygiene standards and SPS requirements in most destination markets. At most, only a few of the largest fruit facilities are export-oriented and are EurepGap and HACCP certified.[159] However, other reports indicate that there are no national food grading, inspection, and labeling systems that comply with international brands.[160] Because China's citrus industry is fragmented and mostly small-scale, it is difficult to meet importing-country standards that require regulators to monitor pesticide use and to ensure that fruit contains no prohibited pests and diseases. Other obstacles to China's orange and lemon export expansion include relatively small-scale unorganized production, inadequate infrastructure and poor transportation, lack of basic storage and cold storage facilities, weak production management and post-harvest handling, low-quality domestic production, poor marketing effort, low-level commercialization and integration, lack of a consistent grading system and safety standards, pesticide and agro-chemical residues, and high business transaction costs.[161] For some Chinese agriculture exports, export licenses are required and often controlled by state-owned enterprises.[162]

Constraints on imports include restrictive import licensing requirements, poor receiver services, lack of good market intelligence, the inability of importers to secure financing, inefficiencies in the foreign exchange market, and lack of legal access.[163] Tariffs remain relatively high despite recent decreases. There are also concerns regarding Chinese intellectual property infringement given unauthorized use of trademarked brands and logos by Chinese fruit sellers and exporters, especially of the Sunkist label.[164] Finally, China's foreign currency exchange rates are reported to be under-valued, making it more difficult to sell imported fruit.[165]

Costs of Production

Available farm-level cost data for citrus production in China is from the 2005 National Agricultural Products Costs & Benefits Data Statistics from the National Development and

[158] USDA, FAS, *GAIN Report* No. CH5607; Gale and Lohmar, "China: En Route," 34; USTR, *National Trade Estimate Report;* Warner, "Behind the Scenes." EurepGAP refers to food safety initiatives started by retailers belonging to the Euro-Retailer Produce Working Group (EUREP). For more information, see *http://www.eurep.org/Languages/English/index_html*. HACCP (Hazard Analysis and Critical Control Point), along with GMP (Good Manufacturing Practice) requirements, refer to the U.S. Food and Drug Administration's primary food safety program.

[159] Interview with Chinese citrus industry officials, February 27, 2006, Shanghai, China; USDA, FAS, *GAIN Report* No. CH5065; Warner, "How Much of a Threat."

[160] Quan and Lui, "An Analysis of Current Problems."

[161] House, "Big Picture;" Huang and Gale, "China's Rising Fruit and Vegetable Exports," 17; Monking, "Fruit Market Overview;" Qi, "Marketing and Distribution;" Sunkist Growers, Public Submission to USTR.

[162] Chapple, "Farm-level Picture." Whether export licensing applies in the citrus industry is uncertain.

[163] Wooton, "Sunkist Experience;" Hanlon, "China's Citrus and Trade."

[164] USDA, FAS, *GAIN Report* No. CH5035; Foster, Statement before U.S.-China Commission.

[165] Wahl, "Does the Value of the Yuan Matter;" Huang and Gale, "China's Rising Fruit and Vegetable Exports," 18; Foster, Statement before U.S.-China Commission. In July 2005, China revalued its currency, the yuan or renminbi (Rmb) and instituted changes to link the yuan to a basket of currencies, allowing it to fluctuate in a narrow band.

Reform Committee (NDRC).[166] These data represent average national production costs for mandarin oranges. Average costs are also reported for Hubei, Guangdong, Fujian, and Chongqing provinces. Given the lack of other available information, these cost data are assumed to reflect growing condition for all types of oranges in China. Cost information for lemons is not collected by the Chinese government, but interviews with farmers who grow both oranges and lemons indicate that there are not substantial differences in average grower costs.[167] The Commission was not able to obtain cost information for citrus packing facilities in China.

Total Costs

National average data for 2004 indicate that the cost to produce mandarin oranges in China is between $2,410-$3,710/ha (table 8-10). Adjusting for reported yields associated with these costs, this translates to an estimated $70/mt to $127/mt. National average costs across all provinces to produce mandarin oranges were $3,310/ha, or $115/mt in 2004. These costs exclude estimated owner-operated labor costs. The official reported cost data include farmer labor costs, estimated to range from about $760/ha to nearly $2,500/ha, depending on growing region.

Information on packing costs is not available; however, marketing costs are reportedly high because of China's relatively inefficient marketing and distribution system, and are reflected in substantially higher wholesale and retail prices for domestic-produced citrus compared to farm-level costs.[168]

Major Cost Components

Direct farm costs and labor account for nearly 90 percent of farm-level costs to grow oranges in China. Other indirect costs, including depreciation and land costs, account for slightly more than 10 percent of production costs.

Hired labor costs are the largest component of costs, accounting for about one-third of farm-level production costs. In 2004, national average per-unit output costs for hired labor were estimated at $1,140/ha, which translated to an average daily cost of about $2-$3 per worker. Some growers and commercial operations hire additional laborers for picking and will face higher costs.[169] As noted earlier, despite low overall labor costs, productivity and output per worker in China remain low by international standards.

Fertilizers and chemicals, such as pesticides and plant-growth regulators, are the second-largest component of costs. Combined costs for chemical fertilizers and pesticides account for another 40 percent of total farm costs in 2004. In 2004, national average annual costs for chemical fertilizer and pesticides were estimated at $850/ha and $500/ha, respectively.

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[166] PRC, NDRC, *National Production Costs and Returns of Agricultural Commodities*, 317-322.

[167] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China. Interview with Chinese citrus industry officials, February 24, 2006, Chongqing, China.

[168] Huang and Gale, "China's Rising Fruit and Vegetable Exports," 14.

[169] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China. Some reported costs are $4-$6 per day (picking); $6-$7 per day (pruning, trimming); $2-$3 per day (applying chemicals).

Table 8-10 Mandarin oranges: Chinese national and provincial costs of production, and national cost shares, 2004 (US dollars/ha)

Cost component	National	Share of total (percent)	Fujian	Hubei	Guangdong	Chongqing
Farm-level production costs:						
Direct Costs	1,820	55	1,760	1,860	2,480	2,840
Seeds	10	([a])	10	10	30	90
Chemical Fertilizer	850	26	750	1,350	1,120	1,930
Organic Fertilizer	300	9	340	70	220	120
Pesticide	500	15	490	390	920	580
Plastic	10	([a])	0	$0	40	0
Rental Equipment[b]	70	3	70	40	40	60
Fuel	10	([a])	$0	$0	50	0
Other[c]	100	3	110	20	110	80
Indirect Costs	170	5	170	220	190	440
Depreciation	120	4	130	60	30	190
Other[c]	60	2	40	160	160	250
Hired Labor	1,140	34	1,350	280	0	420
Land	210	6	210	70	490	50
Total costs	3,310	100	3,460	2,410	3,130	3,710
Per-unit costs (dollars/mt)[d]	115		127	70	85	71
Estimated owner labor costs	840	[e]25	760	950	1,520	2,470

Source: PRC NDRC, *National Production Cost and Return of Agricultural Commodities*, 317-322. Converted by Commission staff from Rmb/mu assuming that 15 mu = 1 hectare = 2.47 acres and 1 $US = 8.27 Rmb (2004 rates). May not add due to rounding.

[a]Less than 1 percent.
[b]Rental equipment includes machinery use fees, irrigation equipment, water fees, and rented animals.
[c]Other direct costs include technical services, tools and machinery, repair and maintenance costs, and other miscellaneous costs. Other indirect costs includes taxes, sales and management expenses.
[d]Per-unit costs assume the following reported yields: 28.8 mt/ha (national); 27.2 mt/ha (Fujian); 34.3 mt/ha (Hubei); 37.5 mt/ha (Guanadong); and 52.3 mt/ha (Chongquing).
[e]Percentage based on adjusted production costs to reflect estimated labor costs of the owner-operator

Cost Considerations

Considerations noted by Chinese researchers regarding these official published data are as follows.[170] First, these costs are based on a low sampling population and there may be wide differences among actual operations. Second, labor costs have been rising. Other production costs are also rising, including costs for energy and other costs for petroleum-based products, water use fees, and other purchased inputs, such as pesticides and fertilizers.[171] Third, there are other costs not reflected in these data, including additional costs due to changing practices such as "wholesome" food initiatives to reduce pesticide and agrochemical use (although adopting such practices may somewhat offset costs for other inputs such as pesticides). Finally, input costs and cost offsets, such as land costs for those operations that pay to lease additional land, or benefits received by some farms, such as start-up costs or subsidized agriculture inputs from local government agencies or foreign companies, may not be reflected in the reported data.

[170] Interview with Chinese government officials, February 22, 2006, Beijing, China.
[171] Ibid.; USDA, FAS, *GAIN Report* No. CH5084; Simpson, "Trio of Typhoons."

Average production costs for citrus are low given overall lower per-unit labor costs relative to competitors, and the exclusion of certain capital and production technology costs. Given that the majority of operations are labor-intensive, low-technology operations, these reported average costs may understate costs incurred at more modernized operations. These data also do not include orchard development costs for growers. Approximate costs for orchard development are reportedly about $1,800 per hectare per year, not including additional land leasing costs, and about $3,700 per hectare per year, including land leasing costs.[172] Finally, these cost data also may not reflect packing and distribution costs to post-harvest locations, and product losses due to high spoilage rates. Marketing costs associated with getting product to market can be very high and likely offset much of the competitive gain from the low farm cost of production.

[172] Interview with Chinese citrus farmers, February 26-27, 2006, Sichuan, China.

CHAPTER 9
Mexico

Introduction

Mexico is a large producer of fresh oranges but a negligible producer of navel oranges and a relatively small-volume producer of lemons. Orange trees have been grown in Mexico for decades and the bulk of production is intended for the domestic market. Mexico has exported small amounts of oranges to the United States, its leading export market, in recent years. The domestic demand for navel oranges is negligible owing to consumer preferences for other varieties. Although limes have long been a part of Mexican culture, lemons are not traditionally consumed. Production of lemons started about 25 years ago to supply fresh lemons almost exclusively for industrial use. Mexico has exported relatively small volumes of lemons to the United States in recent years, principally surplus fresh lemons not shipped for domestic processing.[1] Mexico has generally been a net importer of oranges and a net exporter of lemons.

Competitive strengths of the Mexican fresh orange and lemon industries include the existence of some large-volume, technologically-advanced growers and the close proximity to the U.S. market relative to other foreign competitors. In addition, Mexican lemon producers take advantage of a window of opportunity for shipping to the U.S. market during August-September when the U.S. supply is normally low.[2] Competitive weaknesses for the orange industry include a large number of inefficient growers on small plots of land, a growing season which overlaps that in California, the inability to grow high quality navels, the prevalence of Mexican fruit fly in the majority of growing regions, water scarcity in some growing regions, and the absence of investment capital for improving overall operations.[3] Competitive weaknesses for lemons include smaller-volume growers on small orchards, competition in the U.S. market from abundant supplies of U.S.-grown lemons, some lower quality fruit,[4] and the lack of a domestic market for lemons.

Industry Overview

Oranges are the most important citrus crop grown in Mexico, followed by limes, grapefruit, and tangerines, with most production of oranges sold for domestic fresh consumption. The primary production areas include the coastal region of the Eastern states of Nuevo Leon, Tamaulipas, San Luis Potosi, and Veracruz (figure 9-1). Production of sweet oranges, 4.0 million metric tons (mt) in 2004, is primarily of varieties which yield considerable juice, since most consumers purchase their oranges fresh and then squeeze them at home for fresh juice.[5] The production of navels, which accounted for a very small share of total orange

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[1] Exports to the United States prior to 2003 were small. Interview with Mexican packer/shipper, December 5, 2005, Sonora, Mexico.

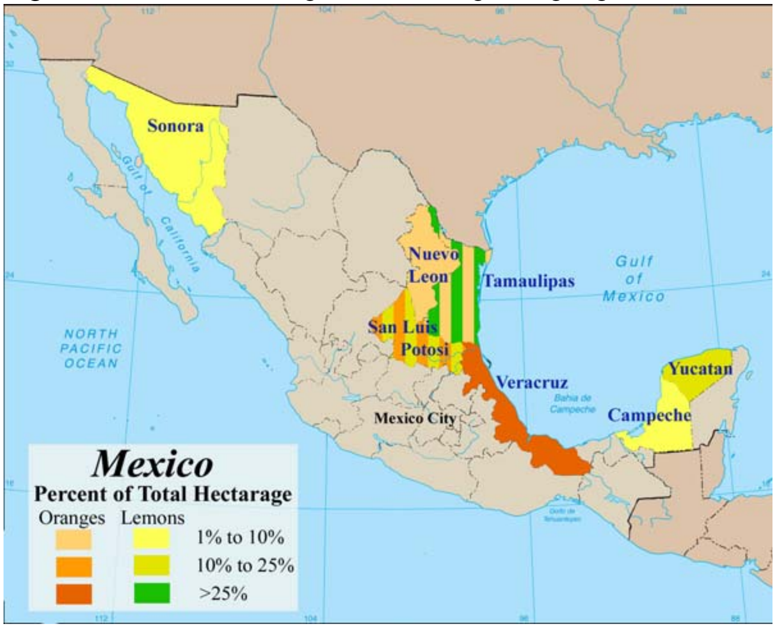
[2] Interview with Mexican packer/shipper, December 7, 2005, Tamaulipas, Mexico.

[3] Interview with Mexican packers/shippers, December 5 (Sonora), December 6 (Nuevo Leon), and December 7, 2005 (Tamaulipas), Mexico.

[4] Interview with Mexican packer/shipper, December 7, 2005, Tamaulipas, Mexico.

[5] Ibid.

Figure 9-1 Mexico: Orange and lemon growing regions



production, amounted to an estimated 12,800 mt annually in recent years. Although official government statistics show the production of lemons[6] to be very small, amounting to 17,400 mt in 2004, industry sources estimate production to be more than 5 times that amount.[7]

Production Trends

Production of citrus fruit amounted to 6.6 million mt in recent years, with oranges accounting for about two-thirds of the total. Production of lemons and navel oranges are negligible relative to Valencia oranges. Overall fresh orange production trended upward during 2000-2004 because of favorable weather during the growing season (table 9-1).[8] Overall weather conditions and the availability of water (e.g., exceedingly strong winds and heavy rainfall, or little or no rainfall at all) usually have the greatest negative influences on production.[9] Although industry data show an upward trend in production of navel oranges during 2000-2004, Mexican industry sources suggest production will never be significant as navels are not easily grown in Mexico because of climatic limitations[10] and the lack of a suitable export market in which to compete successfully (table 9-2). According to official statistics, overall lemon production has risen in the past few years, also from a small base (table 9-3).[11]

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[6] SAGARPA, SAICON database. Official government statistics do not include data for several important lemon growing regions, likely because of the relative unimportance of lemon production in Mexico.

[7] Interview with U.S. industry representatives, July 22, 2005, Washington, DC. Interview with Mexican lemon growers/packers, December 7, 2005, Tamaulipas, Mexico.

[8] USDA, *GAIN Report* No. MX5043, 3.

[9] USDA, *GAIN Report* No. MX4136, 10.

[10] In Sonora, where the hot climate resembles that in Arizona, the varieties of navels that have been grown generally result in an uneven outer surface and a dry or inconsistent fruit texture. In addition, similar to navel production in Arizona, navel blooms tend to fall off the trees at a greater rate than other varieties due to extreme heat. Interview with Mexican packer/shipper, December 5, 2005, Sonora, Mexico.

[11] SAGARPA, SAICON database.

Table 9-1 Oranges: Mexican production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	3,815	4,037	4,022	3,848	3,979	([a])
Production value (1,000 US dollars)	320,085	271,524	329,167	361,205	324,324	([a])
Bearing hectarage (1,000 hectares)	324	327	335	332	335	([a])
Nonbearing hectarage (1,000 hectares)	13	13	14	13	14	([a])
Total hectarage (1,000 hectares)	337	340	349	345	349	([a])
Annual yield (mt/hectare)	9	9	9	9	10	([a])

Source: SAGARPA, SAICON database.

[a]Data not available.

Table 9-2 Navel oranges: Mexican production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	1.5	1.6	20.2	16.5	12.8	([a])
Production value (1,000 US dollars)	120	216	2,573	1,470	1,238	([a])
Bearing hectarage (1,000 hectares)	0.2	0.2	1.5	1.5	1.1	([a])
Nonbearing hectarage (1,000 hectares)	236	234	1,579	1,643	1,494	([a])
Total hectarage (1,000 hectares)	236	234	1,580	1,644	1,495	([a])
Annual yield (mt/hectare)	6	7	14	11	11	([a])

Source: SAGARPA, SAICON database.

[a]Data not available.

Table 9-3 Lemons: Mexican production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	([a])	1.7	3.6	14.6	17.4	([a])
Production value (1,000 US dollars)	([a])	445	320	2,460	3,854	([a])
Bearing hectarage (1,000 hectares)	([a])	([b])	([b])	1.5	2.6	([a])
Nonbearing hectarage (1,000 hectares)	([a])	0	([b])	([b])	([b])	([a])
Total hectarage (1,000 hectares)	([a])	([b])	1.2	2.1	3.0	([a])
Annual yield (mt/hectare)	([a])	4	5	10	7	([a])

Source: SAGARPA, SAICON database.

[a]Data not available.
[b]Less than 1.

The most important varieties of oranges grown in Mexico include Valencia, Hamlin, early season (tempranas), Marrs, and Parson Brown, with Valencia being the most common. Navel oranges grown in Mexico are principally the Washington Navel (table 9-4 orange varieties). The varieties of lemons grown in Mexico include Eureka, Rosenberger, and limoneira.

Growing Regions

About three quarters of total production of oranges takes place in the region along the Gulf coast in the states of Veracruz, Tamaulipas, Nuevo Leon, and San Luis Potosí (table 9-5). The region including the Northwestern states of Sonora and Baja California Sur produce a smaller volume of oranges relative to other regions but is one of only a few areas declared fruit fly free by the United States. Therefore, oranges can be exported from that region to the

Table 9-4 Oranges: Mexican production by variety, 2000-2004 (mt)

Variety	2000	2001	2002	2003	2004
Early season and other	2,390,579	2,436,063	2,109,576	2,003,548	526,827
Valencia	1,420,645	1,597,234	1,890,606	1,825,763	3,437,593
Navel	1,459	1,604	20,211	16,539	12,756
Total	3,814,683	4,034,901	4,020,393	3,845,850	3,977,176

Source: SAGARPA, SAICON database.

Note: Total here do not match those elsewhere in this report due to variations in collection methodologies.

Table 9-5 Oranges: Mexican production by region, 2000-2004 (mt)

Region	2000	2001	2002	2003	2004
Veracruz	1,911,106	1,988,536	2,039,432	1,758,591	1,830,860
Tamaulipas	423,601	379,739	407,191	484,961	483,543
Nuevo Leon	195,633	343,202	306,156	293,357	320,961
San Luis Potosí	294,237	296,068	323,127	367,815	291,034
Yucatan	216,457	189,045	135,683	169,686	186,423
Sonora	137,381	177,430	184,362	181,903	174,847
All other	636,304	662,882	626,444	591,540	691,512
Total	3,814,719	4,036,902	4,022,395	3,847,853	3,979,180

Source: SAGARPA, SAICON database.

United States without undergoing chemical treatment.[12] Nuevo Leon and Tamaulipas are considered to have a low prevalence of fruit fly, but oranges exported to the United States from those states must first be fumigated. Valencias and other round varieties are common throughout the growing regions; navels are grown principally in Veracruz. Lemon production takes place principally in Northeastern Mexico, which has a more arid climate, and trees encounter less problems with humidity than in production areas further south (table 9-6).[13]

Despite Veracruz's dominant role in total Mexican orange production, its high prevalence of fruit fly restricts orange exports to the United States.[14] Relative to Nuevo Leon and Tamaulipas, more orange production from Veracurz is sold to the processing market. This is a function of generally lower relative costs of production since in Veracruz oranges for processing garner lower prices than those sold for fresh consumption.

Table 9-6 Lemons: Mexican production by region, 2000-2004 (mt)

Region	2000	2001	2002	2003	2004
Tamaulipas	([a])	([a])	([a])	11,880	11,044
San Luis Potosí	([a])	1,680	3,600	2,700	6,400
Total	([a])	1,680	3,600	14,580	17,444

Source: SAGARPA, SAICON database.

[a]Data not available.

[12] Chemical treatment can significantly reduce the shelf-life of oranges, limiting export opportunities. Interview with Mexican packer, December 6, 2005, Nuevo Leon, Mexico.

[13] Interview with Mexican grower/packer, December 7, 2005, Tamaulipas, Mexico.

[14] Movement of citrus across state lines within Mexico is also regulated by the Mexican government due to phytosanitary concerns of fruit fly. Interview with USDA officials, December 7-8, 2005, Tamaulipas, Mexico.

Structure and Organization

Growers

There are an estimated 67,000 citrus growers located throughout Mexico, most of which are believed to be growing oranges.[15] In most areas, orchard size is still a function of Mexican land reform of the early 20th century which resulted in the establishment of many government-awarded small-sized plots (ejidos), which were leased to growers.[16] Although laws of the early 1990s now allow ejido farmers (ejidatarios) to sell, lease or share-crop their parcel, small orchard sizes of less than 10 ha still predominate in the states of Tamaulipas, Veracruz, and San Luis de Potosi.[17] In Neuvo Leon, more ejido plots have changed hands and consolidated, resulting in orchard sizes of 30 to over 150 ha.[18] The number of lemon growers is small with an estimated 30 percent of all growers producing about 75-80 percent of all fruit produced.[19] The majority are small-volume producers on small groves that account for a minor share of production, with a handful of other growers that control growing areas of over 1,000 ha.[20] Larger operations have developed in response to the local Coca-Cola bottling plant's need for lemon oil.[21]

Packing Operations

In Mexico, a significant portion of production is not packed into cartons but is shipped in bulk, either from orchards or from assembly points to wholesale produce markets.[22] There are reportedly fewer than 25 packers/shippers handling fresh oranges in Nuevo Leon, only 4 in the Sonora region,[23] and a small number of large-scale operations are believed to handle the oranges in other regions. The size and efficiency of many packers is usually determined by whether the fruit is being packed for export markets or is intended for domestic consumption. Since oranges for export to the United States must be inspected and certified free of fruit-fly, packers of fruit for export have the most developed operations.[24] Since the majority of lemon production is processed for lemon oil, there are only a handful of lemon packers in Mexico, which are generally shipping for export to the United States.[25]

Integration

Large-volume growers of oranges and lemons, including those in Nuevo Leon and Tamaulipas, are often vertically integrated with packing facilities, which typically pack their own fruit as well as that of other growers.[26] Production volumes for some larger orange

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[15] Includes growers of oranges, grapefruit, lemons and limes. USDA, FAS, *GAIN Report* No. MX5043, 8.
[16] Roy, Andrew and Spreen, *Persian Limes*, 19-20.
[17] Ibid.
[18] Interview with Mexican growers/packers, December 6-8, 2005, Nuevo Leon and Tamaulipas, Mexico.
[19] Lacroix, et al., *Marketing*, 14.
[20] Interview with Mexican lemon growers/packers, December 7, 2005, Tamaulipas, Mexico.
[21] Mondragon, et al., *Oranges*, 37, and interview with Mexican lemon producers, December 8, 2005, Tamaulipas, Mexico.
[22] Interview with Mexican orange growers/packers, December 5-9, 2005, Sonora, Nuevo Leon, and Tamaulipas, Mexico.
[23] Interview with Mexican packer, December 6, 2005, Nuevo Leon, Mexico.
[24] Ibid.
[25] Interview with Mexican lemon packer, December 6, 2005, Nuevo Leon, Mexico.
[26] Interview with Mexican orange and lemon growers/packers/exporters, December 5-7, 2005, Tamaulipas and Nuevo Leon, Mexico.

packing operations range from an estimated 80,000 to 100,000 mt processed each season.[27] For oranges, brokers, either directly connected with a packing house or operating independently, take possession of the fruit for final distribution.

Industry Organizations

The Mexican orange and lemon industries are made up of many growers, packers/shippers of varying sizes, brokers and other intermediaries. Most small-volume growers are typically not aligned with any production or marketing association. Larger, more sophisticated operations generally control their own marketing and distribution chains. There are a few industry trade associations that provide assistance to orange and lemon producers in Mexico. The Consejo Nacional de Productores Agricolas de Mexico represents all agricultural interests including citrus. The National Citrus Committee joins producers, packers, and other industry groups in an effort to better integrate the varied interests of the Mexican citrus industry.[28]

Market Overview

Production Utilization

As noted, most orange production is consumed domestically (table 9-7), with small amounts processed commercially into juice and juice products (table 9-8) and the remainder exported.[29] Navel oranges, which yield relatively less juice, are not generally popular although other orange varieties, such as tangerines and other easy-peelers, are consumed as table fruit at holiday times.[30] As shown in table 9-7, Mexican orange exports are extremely limited. There is no domestic market for Mexican-grown fresh lemons and only small amounts are sold in local markets in Tamaulipas, the main growing region. Lemons have recently been exported to the U.S. market in increasing volumes (table 9-9).

Table 9-7 Oranges: Mexican imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2004

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	3,815	35	11	3,839	1	([a])
2001	4,037	27	20	4,044	1	1
2002	4,022	30	17	4,035	1	([a])
2003	3,848	38	7	3,879	1	([a])
2004	3,979	17	15	3,981	([a])	([a])

Source: SAGARPA, SAICON database; Global Trade Atlas data.

[a]Less than 0.5.

[27] Interview with Mexican packer, December 5, 2005, Nuevo Leon, Mexico.
[28] USDA, FAS, *GAIN Report* No. MX5043, 8.
[29] Ibid., 9.
[30] Interview with Mexican packer/shipper, December 5, 2005, Sonora, Mexico.

Table 9-8 Oranges: Mexican production utilization, 2000-2005 (percent share)

Use	2000	2001	2002	2003	2004	2005
Fresh domestic consumption	88	89	91	98	95	87
Processing	12	10	8	2	5	12
Exports	0	1	1	0	0	1
Total	100	100	100	100	100	100

Source: USDA, FAS, (various years).

Table 9-9 Lemons: Mexican imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2004

Year	Production	Imports[a]	Exports[b]	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	([c])	2	1	([c])	-	-
2001	2	2	1	3	66	50
2002	4	2	1	5	40	25
2003	15	2	3	14	14	20
2004	17	1	13	5	20	76

Source: SAGARPA, SAICON database; Global Trade Atlas data, and USITC, DataWeb.

[a]Data are for lemons and limes fresh or dried; most of these data are believed to be limes.
[b]Data represent U.S. import statistics for Mexican lemons. Most Mexican lemon exports are believed to be shipped to the United States.
[c]Data are not available.
[d]Less than 1 percent.

Pricing and Marketing

Most oranges are shipped either from assembly points or from orchards directly to wholesale produce markets such as the Central de Abastos in Eastern Mexico City,[31] where buyers and sellers negotiate sales' transactions.[32] Most sales of oranges are cash transactions made on a daily basis with some processors buying only on a weekly basis.[33] There are some producer prices collected by official sources; [34] however, a lack of reliable timely shipments and pricing data availability severely restrict a grower's ability to negotiate prices.[35] Growers' extremely limited access to credit precludes them from holding their fruit in expectation of higher prices at a later date.[36] Although most oranges are sold to the fresh market, prices in the fresh market can be influenced by prices of oranges going to processing, especially in those years when overall production is lower than usual.[37] The absence of marketing cooperatives of growers limits their ability to negotiate prices as a group.[38] Price margins in Mexico between producer and retail prices for oranges appear to be similar to those in the United States 20 years ago, with major producers forcing downward the grower prices to offset their marketing expenses.[39] Recent wholesale market prices for oranges appear to have

[31] Mexican industry official. Mondragon, *Oranges*, 73.
[32] Mondragon, *Oranges*, 75.
[33] Ibid., 6.
[34] Lacroix et al., *Marketing*, 22.
[35] Ibid., 4.
[36] Ibid.
[37] Mondragon et al., *Oranges*, 97.
[38] Ibid., 6.
[39] Lacroix et al., *Marketing*, 26.

trended upward from 2000 to 2005 (table 9-10).[40] Most lemon producers have fixed price, long-term contracts from the local Coca-Cola bottler.[41]

Table 9-10 Oranges: Mexican wholesale market prices, 2000-2005 (US dollars/kg)

Months	2000	2001	2002	2003	2004	2005
February	0.15	0.14	0.13	0.18	0.17	0.14
May	0.21	0.18	0.29	0.32	0.22	0.17
August	0.29	0.37	0.47	0.40	0.32	0.42
November	0.16	0.16	0.20	0.19	0.17	0.28
Monthly average[a]	0.18	0.21	0.26	0.29	0.22	0.25

Source: Servicio Nacional de Información de Mercados, CIF, Mexico City, as reported in USDA, FAS, *GAIN Reports*.

[a]Monthly averages were calculated as the simple average of all months data reported for each year except 2005. The monthly average for 2005 was caculated using 10 months of prices.

International Trade

Exports

The Mexican citrus industry is a small player in international trade of citrus fruit except for limes, with only small volumes of oranges and lemons exported in recent years. Mexican exports of oranges and lemons/limes[42] were valued at $3.4 million (table 9-11) and $193.6 million (table 9-12), respectively, in 2005, with virtually all exports of each fruit shipped to the United States. Most fresh oranges exported to the U.S. market are from Sonora, but exports are also rising from Nuevo Leon because of the low prevalence of fruit fly in these regions.[43] Growers in Sonora assert that exports to Canada are not likely to expand because of competition from the United States and Spain in that market.[44] The presence of high-quality, U.S.-grown navels makes it difficult for Mexican producers shipping Valencia oranges to compete in the U.S. market.

NAFTA may have indirectly, but positively, affected the Mexican industry by encouraging additional exporters to consider sales in the U.S. market and by increasing U.S. consumer acceptance of products from Mexico.[45] Under the NAFTA, orange and lemon trade between Mexico, the United States, and Canada is not subject to tariffs, quotas or product preferences, although citrus shipments into the U.S. market must meet U.S. grade and inspection regulations. Mexico recently signed a free trade agreement with Japan which provides annual increases in duty-free entry for oranges.[46] In the future, oranges that might otherwise be exported to the United States could instead be exported to Japan or elsewhere. Although lemon exports, almost exclusively to the United States, are still in relatively small volumes, U.S. import data show strong rates of growth in the last two years, as shown in the following tabulation (in mt):

[40] Econometric modeling of how prices may be related to seasonality produced similar results. Mondragon et al., *Oranges*, 81-82.

[41] Interview with Mexican lemon producers, December 7, 2005, Tamaulipas, Mexico.

[42] Mexico trade data for lemons is reported at the 6-digit HTS level aggregated with limes.

[43] USDA, FAS, *GAIN Report* No. MX5043, 9.

[44] Interview with Mexican packer/shipper, December 5, 2005, Sonora, Mexico.

[45] Lacroix et al., *Marketing*, 21.

[46] The agreement went into effect on April 1, 2005, allowing for 10 mt to enter duty-free during the 2005/06 and 2006/07 seasons, then rising to 2,000 mt in 2007/08, 3,000 mt in 2008/09, and 4,000 mt in 2009/10. USDA, FAS, *GAIN Report* No. MX5043, 9.

Lemons: U.S. imports from Mexico, 2000-2005 (mt)					
2000	2001	2002	2003	2004	2005
529	601	1,007	2,746	12,704	12,502

Source: USITC, DataWeb.

Table 9-11 Fresh oranges: Mexican exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	7,723	17,509	16,206	6,882	14,461	13,252
Argentina	2,216	1,805	96	0	0	0
Japan	521	198	251	6	0	0
Germany	136	68	0	0	0	0
Canada	37	75	192	86	362	3
Other	61	26	139	0	0	307
Total	10,694	19,681	16,884	6,974	14,823	13,562
	Value (1,000 dollars)					
United States	2,307	4,068	4,100	1,586	3,227	3,344
Argentina	674	508	33	0	0	0
Japan	918	331	416	10	0	([a])
Germany	38	19	0	0	0	0
Canada	4	16	35	30	151	1.6
Other	10	11	31	0	0	([a])
Total	3,951	4,953	4,615	1,626	3,378	3,431
	Unit value (dollars per metric ton)					
United States	299	232	253	230	223	252
Argentina	304	281	344	([b])	([b])	([b])
Japan	1,762	1,672	1,657	1,667	([b])	([b])
Germany	279	279	([b])	([b])	([b])	([b])
Canada	108	213	182	349	417	0
Other	164	423	223	223	228	0

Source: Global Trade Atlas data.

[a]Less than 0.5 units.
[b]Data not available.

Table 9-12 Fresh lemons/limes: Mexican exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	247,506	24,797	243,655	321,649	358,747	371,284
France	2,673	1,875	1,852	2,295	2,823	1,880
Japan	1,399	608	1,308	1,399	1,569	2,077
Netherlands	3,439	1,295	3,759	1,929	2,324	4,211
United Kingdom	2,246	1,371	1,673	1,008	1,412	831
Other	7,373	2,371	9,801	4,472	6,497	7,218
Total	264,636	32,317	262,048	332,752	373,372	387,501
	Value (1,000 dollars)					
United States	58,389	10,547	48,480	113,592	174,033	178,850
France	2,743	1,991	1,662	726	2,803	1,835
Japan	2,521	1,060	2,247	517	2,707	3,183
Netherlands	2,932	1,218	2,841	611	1,972	4,124
United Kingdom	1,766	1,206	1,041	290	1,375	843
Other	5,294	2,177	4,620	1,410	4,602	4,781
Total	73,645	18,199	60,891	117,146	187,492	193,616
	Unit value (dollars per metric ton)					
United States	236	425	199	353	485	482
France	1,026	1,062	897	316	993	976
Japan	1,802	1,743	1,718	370	1,725	1,532
Netherlands	853	941	756	317	849	979
United Kingdom	786	880	622	288	974	1,014
Other	718	918	471	315	708	662

Source: Global Trade Atlas data.

Imports

Mexican imports of oranges and lemons/limes[47] are very small, valued at $6.9 million (table 9-13) and $552,000 (table 9-14), respectively, in 2005. Imports have accounted for 1 percent or less of apparent consumption annually. Virtually all imports are from the United States and have fluctuated over the past few years, trending downward since 2003. Mexican imports tend to rise when Mexican market prices are high enough to cover transportation costs from the United States and when U.S. over-supply pushes prices in U.S. markets downward.[48] However, a rise in the number of supermarkets in the larger cities in Mexico in recent years may help to increase demand for higher quality fruit and stimulate interest in U.S. navel oranges.[49] As noted, there is reportedly little demand in Mexico for navel oranges or fresh lemons currently, although small volumes of Mexican imports of both from the United States have been recorded over the past five years.

Competitive Factors

Natural Endowments

The climate, soils, and levels of rainfall are generally suited to orange and lemon production in Mexico. In Veracruz, the main production region, there is no danger of frost and plentiful rainfall allowing for good quality production despite the lack of irrigation use there. However, persistent drought conditions in other regions, such as Sonora, limit production.

[47] Mexican trade data for lemons is reported at the 6-digit HTS level aggregated with limes.
[48] Lacroix et al., *Marketing*, 21.
[49] Schwentesius and Gomez, "Supermarkets," 487.

Table 9-13 Fresh oranges: Mexican imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	35,172	27,044	29,527	37,555	16,582	28,370
Argentina	0	0	0	18	0	0
France	0	0	9	0	0	0
Other	([a])	0	0	0	0	0
Total	35,172	27,044	29,536	37,573	16,582	28,370
	Value (1,000 dollars)					
United States	9,054	6,494	6,884	9,410	4,306	6,943
Argentina	0	0	0	3	0	0
France	0	0	11	0	0	0
Other	1	0	0	0	0	0
Total	9,055	6,494	6,895	9,413	4,306	6,943
	Unit value (dollars per metric ton)					
United States	257	240	233	251	260	245
Argentina	([b])	([b])	([b])	167	([b])	([b])
France	([b])	([b])	1,222	([b])	([b])	([b])
Other	([b])	([b])	([b])	([b])	([b])	([b])

Source: Global Trade Atlas data.

[a]Less than 0.5 units.
[b]Data not available.

Table 9-14 Fresh lemons/limes: Mexican imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United States	2,405	1,671	1,480	1,666	991	681
France	0	0	0	1	0	0
Other	0	0	0	0	0	0
Total	2,405	1,671	1,480	1,667	991	681
	Value (1,000 dollars)					
United States	740	453	458	494	433	552
France	0	0	0	2	0	0
Other	0	0	0	0	0	0
Total	740	453	458	496	433	552
	Unit value (dollars per metric ton)					
United States	308	271	309	297	437	551
France	([a])	([a])	([a])	2,000	([a])	([a])
Other	([a])	([a])	([a])	([a])	([a])	([a])

Source: Global Trade Atlas data.

[a]Data not available.

The absence of amenable soil types and the periodic cool temperatures necessary to produce good quality navels hamper the production of navel oranges in Northwestern Mexico. Irrigation is necessary, but irrigation practices are generally inefficient or not used at all. Many production areas are plagued by pests and diseases, and occasional freezes[50] affect Northeastern Mexico. Navel oranges are not suited to any growing areas of Mexico, primarily because the weather is too hot for fruit set and development.[51]

[50] Interview with Mexican packer/shipper, December 7, 2005, Tamaulipas, Mexico.
[51] Ibid.

Water Issues

Water scarcity in some areas and the cost of irrigation in others are concerns for the Mexican orange and lemon industries. In Sonora, drought has plagued production for 10 years. Extremely low water tables and the difficulty of acquiring rights to drill wells hamper productive orchards there. The situation has recently been exacerbated by a government-mandated 14 percent water allocation reduction.[52] Growers there are forced to restrict water applications, leaving orchards unproductive.[53] In Eastern states, especially in Veracruz, water is more plentiful, and irrigation is not common. Larger and more sophisticated growers in Nuevo Leon, however, depend on efficient methods of irrigation, generally drip or microsprinklers. There, irrigation practices increase costs, but also increase yields and quality for the domestic fresh market and for export.[54]

Pests and Diseases

Throughout much of Mexico, a few very serious insect and disease pests, especially the Mexican fruit fly and tristeza disease,[55] cause economic losses to orange growers. Sour orange rootstock, used for the production of most orange trees in Mexico, is very susceptible to tristeza,[56] now prevalent in some production areas.[57] Lemons are not as susceptible to these major pests, but pest-control costs on lemons are still very high. Despite a Mexican government campaign which releases sterile fruit flies to decrease the fruit fly population, Mexican industry sources report that it will be very difficult to completely eradicate the Mexican fruit fly.[58] The presence of the pest severely restricts the majority of production from export to the United States.[59]

Seasonality

In general, Mexican orange production occurs at the same time as that in California. The season for early season oranges in Sonora is November through February and for Valencias is March through June.[60] The production of lemons is generally early- to mid- summer. In recent years, lemons have been shipped to the U.S. market in August and September.[61] The marketing seasons for different varieties of oranges are shown in the following tabulation:

Oranges and lemons: Mexican marketing seasons by variety

Variety	Marketing season
Oranges:	
Valencias	March-June
Early season (tempranas)	November-February
Navels	November-February
Lemons	August-October

[52] Interview with Mexican grower/packer, December 5, 2005, Sonora, Mexico.
[53] Ibid.
[54] Interview with Mexican growers/packers and industry representatives, December 6-9, 2005, Montemorelos and Monterrey, Nuevo Leon, Mexico.
[55] Mondragon et al., *Oranges,* 3 and 35.
[56] Ibid., 3.
[57] Interview with Mexican grower/packer, December 7, 2005, Ciudad Victoria, Tamaulipas.
[58] Interview with Mexican grower/packer, December 6-7, 2005, Nuevo Leon and Tamaulipas, Mexico.
[59] Interview with Mexican grower/packer, December 7, 2005, Tamaulipas.
[60] Interview with Mexican packer/shipper, December 5, 2005, Sonora.
[61] Interview with Mexican grower/packer, December 7, 2005, Tamaulipas.

Labor

Labor has historically been plentiful and relatively inexpensive in Mexico.[62] However, the use of unskilled workers can negatively affect productivity. The overall availability of skilled labor is low and many workers will leave agricultural production jobs to work elsewhere.[63] In Nuevo Leon, orange producers encounter competition for workers from nearby maquiladora operations.[64] Certain packing houses are able to attract and retain labor by staying in operation all year, whereas other houses that are usually in operation only for a limited number of months have problems retaining workers.

Land

The legacy of land reform in Mexico has resulted in a number of complex land-ownership and land-use arrangements in the citrus industry. In the early 1900s large numbers of ejidos were awarded to groups of farmers by the Mexican government.[65] Many plots, which today can be bought or sold, remain in their original form and are so small as to limit a farmer's ability to benefit from economies of scale in raising citrus.[66] In recent years, about one-half of all ejidos were located in Veracruz, Tamaulipas, and San Luis Potosí.[67] Most of the larger, better-managed orchards are on privately-owned land.[68] Production in Nuevo Leon is considered more efficient because more ejido land has been converted to private ownership and consolidated over time.[69] However, urbanization pressures in that state, especially surrounding Monterrey, are driving up land costs, increasing opportunity costs for land in citrus production.

Yields

The use of advanced production technologies and trade densities play a large role in orange and lemon yields in Mexico. Orange yields averaged 10 mt/ha in 2004 but the majority of growers have yields well below 5 mt/ha, in part because these growers are not able to afford and implement additional inputs, such as the replanting of diseased or unproductive trees. Tree densities affect yields by increasing production volume for a given area, and can vary appreciably among orchards. Some newer plantings have been designed with higher densities for this purpose. In new orchards that have been planted within the past 20 years, tree densities can average 320 trees/ha.[70] In older orchards in western Tamaulipas/Eastern San Luis Potosí, tree densities typically average 50-150 orange trees/ha.[71] In Montemorelos, Nuevo Leon, and surrounding areas, orange-tree densities average about 145 trees/ha.[72] Lemon-tree densities for many larger lemon-tree-growing operations in Tamaulipas are higher than those for oranges and may range from 150-250 trees per ha,[73] likely because

[62] Mondragon et al., *Oranges*, 3.
[63] Interview with Mexican growers/packers, December 6-7, 2005, Nuevo Leon and Tamaulipas, Mexico.
[64] Interview with Mexican grower/packer, December 6, 2005, Nuevo Leon, Mexico.
[65] Interview with Mexican juice producer, December 9, 2005, Nuevo Leon, Mexico.
[66] Land in orange production is typically operated under a number of different working arrangements, including the following: 100 percent of the land is ejido-owned, 100 percent is privately owned, any combination of both ejido and private ownership, ejido and private leases, ejido and ejido leases, and ejido and private investment. Mondragon et al., *Oranges*, 3-4.
[67] Mondragon et al., *Oranges*, 107.
[68] Ibid., 33-36.
[69] Interview with Mexican industry representative, December 9, 2005, Monterrey, Nuevo Leon.
[70] Mondragon et al., *Oranges*, 49.
[71] Ibid., 36.
[72] Ibid., 32.
[73] Interview with Mexican lemon producers, December 6, 2005, Tamaulipas, Mexico.

lemon production was developed more recently in Mexico. Some large-volume producers are able to generate yields of 20-30 mt/ha.[74]

Production Technology

It is difficult to generalize the use of production technology in orchard cultural practices in Mexico. Growers in Nuevo Leon are reported to be using some of the best cultural practices including high tree densities, fertilizer, and herbicide use,[75] whereas growers in Veracruz range in their use of technology from advanced production practices to groves using very basic production techniques.[76]

The level of technology used throughout the entire industry is dramatically higher in medium to large operations, where producers may not own machinery, such as tractors or sprayers, but may lease equipment, and use fertilizers to improve yields. About one-half of Mexican citrus growers likely fall in this category.[77] Producers with the largest-sized operations are likely vertically integrated, involved with marketing activities for their production, own their own equipment, and irrigate a large portion of their land.[78] In small orchards grower technology is often limited to the manual removal of weeds and dead wood from the orchard floor and the harvesting of whatever fruit is produced.[79] As prices increase in a given season, these producers may make one application of fertilizer, using large amounts of manual labor. The marginal success of smaller-volume growers has been attributed to such factors as a limited access to capital for investing in better technology, limited availability and the respective high cost of inputs, and an inability to achieve economies of scale because of the small orchard size and consistently low yields.[80]

Government Policies and Support

The amount of government assistance currently in place for assisting orange and lemon growers or packers is small and is not likely to have a measurable effect on the performance of citrus operations. The Government of Mexico is using some funds to modernize farming practices through educating farmers and improving the industry through such things as better supply chain integration.[81] Examples of such modernizing programs are the Fund for the Investment and Capitalization of the Rural Sector (FOCIR) and the Shared Risk Fund for Agribusiness Support (FOMAGRO).[82] Transfer funds also pass from the Federal government to local and state governments for agricultural support. Reportedly, there are some government programs in place to offset some of the costs of putting in an irrigation system.[83] DINIFAP, the research arm of the Mexican agricultural ministry, has reportedly done some studies on citrus varieties that tolerate of certain insect pests and diseases.[84]

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[74] Interview with Mexican grower/packer/juice processor, December 7, 2005, Tamaulipas, Mexico.
[75] Mondragon et al., *Oranges*, 33.
[76] Ibid., 45.
[77] Ibid., 33.
[78] Ibid., 31.
[79] Ibid., 29, and interview with Mexican growers/packers, December 5-7, 2005, Sonora, Nuevo Leon, Tamaulipas, Mexico.
[80] Interview with Mexican industry representatives, December 8, 2005, Tamaulipas, Mexico.
[81] Ibid.
[82] Interview with Mexican growers/packers, December 5-9, 2005, Sonora, Nuevo Leon, and Tamaulipas, Mexico.
[83] Interview with Mexican growers/packers, December 5-7, 2005, Sonora and Nuevo Leon, Mexico.
[84] Ibid.

Regulatory Compliance

Mexico's citrus industry is generally not regulated by the Mexican government. Fruit grades and standards have yet to be established for the domestic market and made a part of the production-through-marketing transaction.[85] Mexico's ability to increase exports, however, depends on its ability to meet import and SPS requirements in foreign markets. The industry has reported that the failure of significant numbers of orange growers to apply pesticides more effectively and to diligently implement the Mexican government's fruit fly erradication program is a function of the Mexican industry's focus on the domestic market.[86] For its part, the small segment of the Mexican orange and lemon industries that produces for export complies with product standards and other requirements of foreign markets.

Business Climate and Investment

The Mexican agriculture sector has a history of capital and credit problems.[87] Although the high interest rates of the 1980s and early 1990s have decreased, they have remained relatively high for the average Mexican farmer.[88] Some medium to large producers can secure loans from banks, or other producers or middlemen, but because citrus revenue is not always well-administered or reinvested in the land, large debts are not easily paid down.[89] Since the 1994 peso devaluation, banks are particularly conservative in lending to most agricultural enterprises.[90] Packers are unable to replace old, outdated packing machinery because of a lack of financing.[91] In general, Mexican agriculture, including the citrus industry, is supported by brokers who pay growers in cash on the spot for loads of fruit just picked, or help finance grower/packers that export.[92]

Costs of Production

The production costs presented in this section are based on Commission field visits and interviews with Mexican producers and exporters. The data are believed to be typical of larger growers and packers producing fresh oranges and lemons for both domestic consumption and export markets.

Mexican farm-level costs for oranges were compiled from reported costs for growers in the state of Sonora, Northwestern Mexico.[93] The majority of oranges grown in Sonora are 'tempranas' (early-season varieties), however, Mexican industry representatives reported that the costs for growing tempranas are similar to those for growing navels. Packing house costs are believed to be indicative of costs for large-scale, export-oriented operations in Mexico.

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[85] Mondragon et al,, *Oranges*, 72.
[86] Interview with Mexican growers/packers, December 6-7, 2005, Nuevo Leon, Mexico.
[87] Mondragon et al., *Oranges*, 3.
[88] Roy, Andrew, and Spreen, *Persian Limes*, 4.
[89] Mondragon et al., *Oranges*, 30.
[90] Interview with Mexican growers/packers, December 5-7, 2005, Sonora and Nuevo Leon, Mexico.
[91] Ibid.
[92] Ibid.
[93] Almost half of Mexican orange production and more than 80 percent of navel production takes place in Veracruz, which has been designated as a high prevalence zone for fruit fly by the USDA. Exports to the United States of citrus from such zones in Mexico are generally prohibited. While production in Sonora accounts for only approximately 10 percent of total orange production in Mexico, due to its USDA designation as fruit fly free, it is the only significant orange producing region in Mexico that can export to the United States without fumigation treatment or phytosanitary-related inspection, which negatively impact orange quality and add significant costs at the packer level.

Packing costs can vary significantly, however, due to additional phytosanitary-related treatments required in particular regions and widely varying input costs such as energy.

Mexican grower costs for lemons were compiled from reported costs for growers in the Ciudad Victoria region of the state of Tamaulipas. The vast majority of lemon production in Mexico is grown under contract for lemon oil production. Costs represent grower and packer costs for the small portion of production shipped fresh for export, and represent operations that are large in scale and that use high levels of technology relative to Mexican standards. Costs reflect production conditions for 2005.

Total Costs

Reported grower costs for oranges (table 9-15) were $1,300/ha ($65/mt). These itemized costs fall on the low end of general information on costs provided by Mexican industry representatives for the region, which ranged between $1,300-$1,600/ha. Packing costs for oranges total $100/mt. Total grower costs presented for lemons were $1,400/ha ($56/mt) (table 9-16), or on the high end of the $800-$1,350/ha range generally reported by other Mexican industry representatives. Packing costs for lemons, reported to be $222/mt, are more than double those for oranges, reportedly due to the special handling required because of their shape.

Table 9-15 Oranges: Mexican costs of production and cost shares, 2005

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Share of total (percent)
Farm costs:			
Field preparation	70	3.5	1
Operating costs:			
Labor (excluding harvest)	780	39	15
Machinery and fuel	105	5.3	2
Energy	250	12.5	5
Fertilizer, pesticides, fungicides	95	4.8	2
Total field costs	1,300	65	25
Harvest (labor, machinery, fuel, transport to packing house)		40	15
Packing costs:			
Packing house labor and overhead		35	13
Packing materials (boxes and pallets)		65	25
USDA inspection (fruit fly low prevalence regions only)		56	21
Total cost, packed (not incl. transport to port)		261	100

Source: Compiled and estimated by Commission staff based on field interviews with Mexican industry officials, December 4-10, 2005, Mexico.

Note: Assumed yield is 20 mt/ha. Converted to U.S. dollars at a real exchange rate of $1 = 9.57 pesos.

Table 9-16 Lemons: Mexican costs of production and cost shares, 2005

Cost component	Value (US dollars/ha)	Value (US dollars/mt)	Value (US dollar/ 40 lb. carton)	Share of total (percent)
Farm costs:				
Labor (excluding harvest)	350	14		4
Energy	250	10		3
Fertilizer and insecticides	800	32		9
Total farm costs	1,400	56		16
Harvest (labor, machinery, fuel, transport to packing house)		60		18
Packing costs:				
Packing house labor and overhead		106	1.92	31
Packing materials (boxes and pallets)		116	2.11	34
Total cost, packed (not incl. transport to port)		338		100

Source: Compiled and estimated by Commission staff based on field interviews with Mexican industry officials, December 4-10, 2005, Mexico.

Note: Assumed yield is 25 mt/ha. Converted to U.S. dollars at a real exchange rate of $1 = 9.57 pesos (2000 prices).

Major Cost Components

Major production costs for oranges are labor, energy, and machinery including fuel (table 9-15). Labor, including field, harvest, and packing house labor, constitutes the largest overall cost component at almost one-third of total costs. Harvest labor is the largest labor component for oranges.[94] For lemons, packing house labor is the most significant labor cost (table 9-16). Materials constitute the majority of packing costs; however, packing house labor, which includes employee meals, constitutes 30-50 percent of non-materials packing costs. In Sonora, due to the region's status as a fruit fly free zone, total packing costs for oranges do not include costs for USDA inspection. In other orange production regions, USDA inspection can add up to 50 percent to packing costs.[95] Similar to most industries, pick and haul costs for oranges are generally paid for by the packing house and can cost $40-$60/mt.

Reported Cost Considerations

Growing costs for oranges vary widely in Mexico due to the varied intensity of cultural practices such as fertilizer or irrigation use, as well as the varying natural growing conditions. Growers in Nuevo Leon have more intense cultural practices, and therefore higher costs, relative to production in other Eastern Mexican citrus regions, such as Tamaulipas, where rainfall is more plentiful and irrigation often is not used. As a result, orange production from Nuevo Leon is geared more toward the fresh market to garner higher prices. In Sonora, production for the export market requires intense cultural practices, but inefficient flood irrigation is generally used since most growers cannot make the investment in other methods. Also, a deeper water table in Sonora results in higher energy costs for extracting water relative to other regions such as Nuevo Leon where water levels are not as deep. In addition, producers in Nuevo Leon can take advantage of economies of scale more so than those in Tamaulipas and Veracruz, who are limited to smaller plot sizes. Although

[94] The traditional method of harvesting in Mexico involves one 20-ton truck and 15 laborers. This method yields 1-1.4 mt/picker/day. A semi-automated method, not common in Mexico, using a truck and several tractors to haul fruit from the center of the orchard, typically yields 2-2.8 mt/picker/day.

[95] Lemons are not a host of the fruit fly, and therefore do not require inspection or pre-treatment for export to the United States.

packing costs are believed to be indicative of costs throughout Mexico, approximately 60-65 percent of Mexican orange production is not typically shipped to a packinghouse, but is shipped in bulk directly from the orchard to wholesale markets throughout Mexico.[96] Most lemon production is used for processing and does not get packed. Costs reported by packers in Nuevo Leon for packing and materials were considerably higher than those in Sonora, not including the cost for USDA inspection.[97]

For lemons, production varies across the microclimates within the main growing region of Tamaulipas. For example, water is limited in the central zone of the state where climatic conditions produce excellent quality lemons, while outside that zone water is plentiful but humidity negatively affects lemon quality. Since the majority of Mexican lemons currently are grown under contract, growers practice the same cultural care for lemons destined for processing as for those lemons shipped fresh to the export market. High chemical costs for lemons grown under contract are reportedly due to a requirement for applications of only those chemicals that are approved by the U.S. Food and Drug Administration.[98]

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[96] In general, Mexican consumers, who typically juice the oranges in the home, are accustomed to purchasing oranges in this form.

[97] One Nuevo Leon citrus packer, who packs some oranges, mandarins, and grapefruit for domestic consumption and export, reported costs for packing, materials, and USDA inspection of $40, $65, and $50/mt, respectively, for a total of $155/mt.

[98] Lemons are grown under contract for the local Coca-Cola bottler. Interview with Mexican lemon producers/exporters, December 6-7, 2005, Tamaulipas, Mexico.

CHAPTER 10
South Africa

Introduction

Although South Africa is a relatively small producer of citrus, it is the third largest global exporter of all fresh citrus and the second largest exporter of both oranges and grapefruit, individually.[1,2] In contrast to representing less than 2 percent of world production of oranges and lemons, South African citrus accounted for about 12 percent of world exports in 2004.[3] As a counterseasonal supplier to the Northern Hemisphere, South Africa represents just over one-half of all Southern Hemisphere exports of fresh citrus.[4] Exports destined for Europe, Japan, the Middle East, Russia, the United States and other foreign markets drive the domestic citrus industry, representing about 65 percent of production and up to 90 percent of income.[5] The South African government deregulated the citrus industry in 1997, which created challenges for the industry ranging from establishing its own research capacity to restructuring marketing channels while focusing production on quality and diversity. This, along with several poor growing seasons and an increasingly oversupplied world market, has lead to a slowing of growth in citrus production, which is forecast to stabilize at about 1.5 million mt per year.[6]

Industry Overview

Production Trends

South Africa maintained 56,407 hectares of citrus crop in 2004 accounting for 1.72 million mt of fruit. Oranges and lemons, respectively, accounted for 36,877 and 5,026 planted hectares. Navels account for 40 percent of oranges or one quarter of total citrus with Valencias making up the balance of oranges and 40 percent of total citrus production.[7] In addition, there have been some production shifts towards late navels from late Valencias.[8]

Industry average yields ranged between 40-46 mt/ha for oranges and between 50-73 mt/ha for lemons (tables 11-1 and 11-2).[9,10] For both oranges and lemons, yield peaks occurred in 2002, with drought in 2003 negatively affecting yields the following year. With the exception of lemons and some early harvesting of oranges, citrus is "clean picked" or only

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[1] South Africa was the second largest orange exporter in 2005, exceeding U.S. exports for the first time, due in part to poor weather conditions affecting U.S. orange production.

[2] CGA, *Key Industry Statistics*.

[3] FAOSTAT data (2005).

[4] Interview with South African exporter. January 16, 2006, Western Cape, South Africa.

[5] Ibid.

[6] Interview with South African grower/packer. January 23, 2006, Mpumalanga, South Africa.

[7] CGA, *Key Industry Statistics*.

[8] Australia Citrus Growers, "Know your Competition."

[9] Producers stated that full potential yields are 90-100 mt/ha for oranges, however 60-80 mt/ha a realistic goal and 50-60 mt/ha is the average. Philp, *South Africa Citrus Industry*.

[10] Ten-year average yields were 30 mt/ha (1,890 cartons per hectare) and 42 mt/ha (2,640 cartons per hectare) for navels and Valencias, respectively. Interview with South African grower association representatives, January 16, 2006, Western Cape, South Africa.

one sweep is made through the orchard to harvest all fruit. Reportedly, tree density averages about 666 trees/ha, but can range up to 830 trees/ha.[11]

Poor crop returns in 2000 and a saturation of oranges and lemons on the world market have led to a leveling off of production in recent years. South African orange production, averaged 1.1 million mt during 2003-2005 (table 10-1). To a lesser degree, lemon production also leveled off during the period (table 10-2). Orange and lemon production volumes peaked in 2002 and production values peaked in 2004. An industry focus on activities such as improving fruit quality and market awareness contributed to increased prices, which is reflected in the large increase in the value of production during 2000-2004.

Table 10-1 Oranges: South African production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	1,118	1,263	1,267	1,148	1,113	1,038
Production value (1,000 US dollars)	134,476	212,276	173,406	315,995	336,883	([a])
Bearing hectarage (1,000 hectares)[b]	28	30	27	27	27	([a])
Nonbearing hectarage (1,000 hectares)[b]	9	10	8	9	9	([a])
Total hectarage (1,000 hectares)[b]	37	40	36	36	36	38
Annual yield (mt/hectarage)[c]	40	42	46	43	42	([a])

Sources: CGA, *Key Industry Statistics*; NDA, *Agricultural Statistics*.

[a]Data not available.
[b]Bearing hectarage" represents "area harvested" and "total hectarage" represents "area planted" with "non-bearing hectarage" being the difference between the two.
[c]Calculated.

Table 10-2 Lemons: South African production volume, value, area, and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	120	170	190	182	183	183
Production value (1,000 US dollars)	22,437	30,068	26,467	48,964	74,532	([a])
Bearing hectarage (1,000 hectares)[b]	2	3	3	2	3	([a])
Nonbearing hectarage (1,000 hectares)[b]	1	2	2	3	2	([a])
Total hectarage (1,000 hectares)[b]	4	5	5	5	5	5
Annual yield (mt/hectarage)[c]	50	60	73	66	68	([a])

Sources: CGA, *Key Industry Statistics*; NDA, *Agricultural Statistics*.

[a]Data not available.
[b]Bearing hectarage" represents "area harvested" and "total hectarage" represents "area planted" with "non-bearing hectarage" being the difference between the two.
[c]Calculated.

Despite increases in production and revenue, the industry remains under pressure. The South African industry views the international fresh orange and lemon market in the coming years as being over supplied.[12] Despite high returns overall for exports, exporters did not receive the high returns in 2005 they were expecting from particular export markets such as Japan and the EU. Lower returns were a function of a stronger Rand, which caused increased competition from South American producers in the EU and oversupply in the Japanese

[11] Interview with South African grower/packer, January 20, 2006, Mpumalanga, South Africa.
[12] Interview with South African export association representative, January 16, 2006, Western Cape, South Africa.

market.[13] The U.S. market was the exception to this trend, with South African exporters receiving increased revenues from exports to the United States.[14]

According to industry sources, citrus production is not expected to increase significantly in the foreseeable future. Any increases are expected largely through increased productivity (i.e., replanting and new irrigation technology), rather than increased hectarage.[15] The exception to this will reportedly be in the Northern Cape in the Orange River Valley. The Orange River Valley Region is currently under table grape production, but due to financial insolvency in the sector, production there could shift towards citrus.[16]

Growing Regions

Citrus is produced throughout most of South Africa, as well as Swaziland (figure 10-1). The largest citrus production area in 2005 was Limpopo followed by Eastern Cape, Mpumalanga and Western Cape. The following tabulations show the most recent data for actual production levels by state:

Oranges: South African production by region, 2002 (1,000 mt and percent share)

Region	Oranges	Share
Limpopo	440	35
Mpumalanga	259	21
Eastern Cape	250	20
Western Cape	220	18
Kwazulu-Natal	47	4
North West	24	2
Northern Cape	12	1
Free State	2	([a])
Gauteng	1	([a])
Total	1,254	100

Source: NDA, *Census of Commercial Agriculture* (2002).

[a]Less than 1 percent. May not add due to rounding.

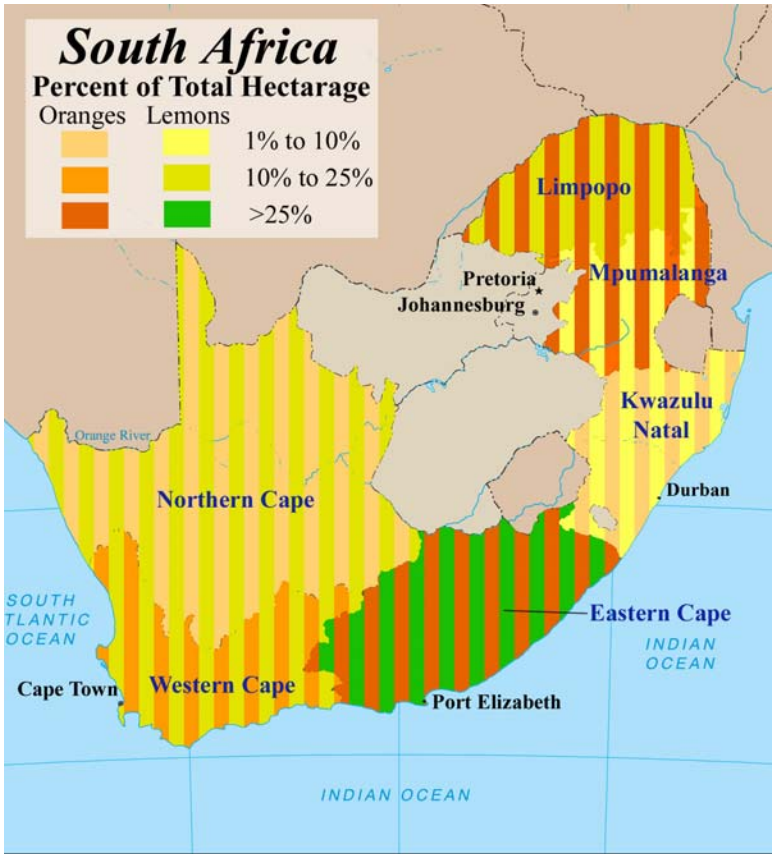
[13] Credit Guarantee, "An Export Perspective of the Fruit Industry in South Africa."
[14] USDA, FAS, *GAIN Report* No. SF5039.
[15] Interview with South African grower/packer, January 20, 2006, Mpumalanga, South Africa. One third of plantings were less than seven years of age in 2003. Philp, *South African Citrus Industry*.
[16] Interview with South African industry association representative, January 17, 2006, Western Cape, South Africa.

Lemons: South African production by region, 2002 (1,000 mt and percent share)		
Region	Lemons	Share
Eastern Cape	40	54
Limpopo	13	18
Western Cape	12	16
Mpumaianga	4	5
Kwazulu-Natal	4	5
North West	1	1
Other	([a])	([b])
Total	74	100

Source: NDA, *Census of Commercial Agriculture* (2002).

[a]Less than 500 mt.
[b]Less than 1 percent. May not add due to rounding.

Figure 10-1 South Africa: Orange and lemon growing regions



The Orange River Valley, in the Northern Cape, initiated a U.S. APHIS "blackspot free" accreditation process,[17] that could become the motivation for significant hectarage expansion by the South African citrus industry.[18] Production in this area will be limited to within a few

[17] Interview with South African government official, January 24, 2006, Pretoria, South Africa.
[18] Interview with South African grower/packer, January 20, 2006, Mpumalanga, South Africa.

kilometers of the river itself and rely on irrigation, as the region is generally unsuitable for agriculture because of low rainfall.[19]

Navel production is primarily located in the Eastern Cape (40 percent) and the Western Cape (27 percent). Similarly, lemon production is also located in the Eastern Cape (49 percent) and the Western Cape (19 percent).[20] In contrast, Valencia production is primarily located in Limpopo (41 percent) and Mpumalanga (22 percent). Navel production is better suited for the cooler climate of the coastal region of southern South Africa, while Valencia production is more tolerant of the sub-tropical climate of northern South Africa.

Navel production is concentrated most heavily in the Palmer, Washington, Bahianinha and Robyn varieties (table 10-3), which make up one-half of navel production, with at least another 13 varieties in use. In terms of Valencias, the Delta, Midknight, Turkey, and Oukloon varieties are most popular. Eureka and Eureka SL make up about 95 percent of lemon production with four more varieties (Lisbon, Genoa, Limoneira and Fino) making up the balance.[21] The Eureka SL, the only seedless lemon variety in the world,[22] is only grown in South Africa.[23]

Table 10-3 Oranges: South African production by variety, 2003-2005 (ha)

Variety	2003	2004	2005
Navels:			
Unspecified Navels + Others	8,051	6,856	7,379
Palmer	2,053	3,075	2,377
Washington	1,372	1,488	1,414
Bahianinha	1,114	1,107	1,407
Robyn	857	989	896
Lane Late	203	610	188
Valencias:			
Unspecified Valencias + Others	7,342	7,614	7,692
Delta	6,772	6,782	7,228
Midknight	5,184	5,289	5,377
Turkey	1,633	1,725	1,907
Oukloon	1,903	1,346	1,771
Total	36,484	36,877	37,636

Source: CGA, *Key Industry Statistics*.

[a]Data not available.

Structure and Organization

The South African citrus industry has undergone significant change over the past decade. In 1997, the South African government began issuing additional export certificates ending the sanctioned monopoly over exports of the single-desk exporter, Capespan.[24] Capespan had

[19] Interview with South African industry association representative, January 17, 2006, Western Cape, South Africa.

[20] CGA, *Key Industry Statistics*.

[21] Ibid.

[22] Interview with South African academic, January 17, 2006, Western Cape, South Africa.

[23] The plant breeders' rights and trademark are maintained by the South Africa Agricultural Research Council.

[24] In the first year the government increased export certificates from one to about 200 certificates.

used a pooling system for prices and was active in industry-improvement programs. With the privatization of Capespan, the organization was streamlined by shedding functions that it could no longer justify, such as the costs of conducting industry research. In Capespan's wake, new industry trade organizations were established and designed to organize, coordinate, and improve the competitiveness of the South African citrus industry.

Growers

Although they account for only about one-third of total citrus farms, export oriented, commercial farms are the primary source of internationally competitive production. Orchards in the Western Cape average 30-40 ha with the largest producing on about 200 ha.[25] Orchards are larger in other provinces with the largest in the Eastern Cape (4,500 ha). The Western Cape has the most orchards (687 operations), 47 percent more than the Eastern Cape and 128 percent more than Limpopo.[26] There are approximately 1,300 export-oriented operations and 2,200 small-scale, domestic-oriented farms in South Africa.[27]

Packing Operations

Packing houses in South Africa use advanced technologies. Depending on region and type of fruit packed, South African pack houses differ in size, ownership, and packing abilities. Altogether there are 75 pack houses in South Africa, with the smallest capable of handling about 400,000 cartons.[28,29] In the Western Cape, private cooperatives have established some of the world's largest packing facilities.[30] After the 1997 deregulation, some larger farms built their own private packing houses to capture more of the returns from the value chain.[31] To help spread the fixed costs, some smaller packing houses in the Western Cape pack deciduous fruit that are counterseasonal to citrus.

Integration

Those packing houses that remained operational after deregulation, and were formerly owned by cooperatives, have been incorporated into private companies and the previous cooperative members are now shareholders. These companies along with grower and vertically integrated export agents are the primary owners of packing houses in South Africa. Two multinational export agents, Unifruiti and Safe, have vertically integrated backwards into citrus production.[32]

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[25] Reportedly, four producers in the Western Cape produce approximately one-half of total provincial production.

[26] CGA, *Key Industry Statistics*.

[27] Credit Guarantee, "An Export Perspective of the Fruit Industry in South Africa." "Small-scale" farms refer to less than 100 trees. See: Philp, *South African Citrus Industry.*

[28] Due to the capital intensity of building a packhouse, a 400,000 carton packhouse is considered the breakeven point.

[29] One carton is approximately 15 kg.

[30] Mather, "Regulating South Africa's Citrus Export Commodity Chain(s) after Liberalisation."

[31] Interview with South African industry association representative, January 18, 2006, Western Cape, South Africa.

[32] Ibid.

Industry Organizations

Prior to 1997, the South African citrus industry was organized around a single desk exporter, Capespan.[33] Capespan used a pooling system for growers, which gave more incentive to provide high volumes rather than high quality and diverse citrus varieties.[34] Since deregulation, Capespan privatized and dropped a number of its previous functions that benefitted the industry as a whole, such as its funding of the Citrus Research Institute. Capespan now functions primarily as a fruit export agent with ownership over the Fresh Produce Terminals in Capetown, Port Elizabeth, Durban, and Maputo.[35]

Market instability and declining profits after the 2000 marketing season led the industry to establish several new organizations. The Citrus Growers Association (CGA) was established to carry out some of Capespan's previous functions.[36] The CGA's budget, $3.28 million in 2005/06, is funded through a mandatary statutory levy of $ 0.056 per 15 kg export carton, which is less than one percent of production costs.[37] In 2004, about 80 percent of the levy went towards research.[38] The CGA also uses its funds to help increase export market access. In 2004, the CGA worked for market access in Israel, Australia, Iran, and Thailand and helped ensure lowering of duties of South African citrus into Russia.[39] The CGA also recently hired a Transformation Manager to help increase the "economic participation and supply" of quality citrus from previously disadvantaged groups.[40]

The CGA also provides assistance through the Citrus Research Institute (CRI) (65 percent of the budget) and through other programs such as those related to sanitary and phytosanitary market access for exports (nine percent). The CRI provides capacity building, integrated pest and disease management programs, crop load and fruit quality programs, extension services, a citrus improvement program and a cultivar development program.[41] CRI staff include government-salaried professors at the Universities of Stellenbosch and Pretoria, making the CRI one of the few methods by which the government indirectly supports the industry.[42]

Another industry organization is Citrus South Africa (CSA), representing 90 percent of citrus producers, which maintains a voluntary levy to provide market information and communication technology to farmers.[43] The Fresh Produce Exporters Forum, an umbrella organization for marketing and export promotion, represents 72 South African export companies. Though Capespan remains the largest citrus export agent with about 30 percent of the market, other international export agents, including Dole, Unifrutti, Safe, Katope, and Del Monte, play important roles in the trade.[44]

[33] Capespan is the merger name of the citrus single-desk exporter (Outspan) and the deciduous fruit single desk exporter (Unifruco).

[34] Mather, "Regulating South Africa's Citrus Export Commodity Chain(s) after Liberalisation," 12

[35] A majority of South African citrus is exported through the Fresh Produce Terminals.

[36] USDA, FAS, *GAIN Report* No. SF5016, 3.

[37] CGA, "CGA Levy."

[38] CGA, *Annual Report*.

[39] Ibid.

[40] Ibid.

[41] Ibid.

[42] Interview with South African academic, January 17, 2006, Western Cape, South Africa.

[43] USDA, FAS, *GAIN Report* No. SF5039, 4.

[44] Interview with South African industry association representative, January 18, 2006, Western Cape, South Africa.

Market Overview

Production Utilization

Well over half of South African citrus production is destined for fresh market export. Lower quality fruit is sent to the domestic fresh or processing markets. For oranges, the industry averaged 61 percent of production going to export, 19 percent to domestic consumption, 18 percent to processing, and two percent waste over the five-year time period. Some more competitive producers have a slightly higher return mix.[45,46] In terms of exports, producers' returns are roughly $0.39/kg on exported oranges, $0.13/kg on local fresh market oranges and about $0.03/kg for processing oranges.[47] Consequently, given the price advantage, producing for the export market is a clear priority for producers over sales to the local fresh market and processing.

Domestic Consumption

On a per capita basis, South Africans consumed about 11 kg of oranges in 2003, while lemon consumption was just under 2 kg.[48] During the last two decades, per capita consumption of both oranges and lemons doubled owing to increased production. Domestic consumption of oranges and lemons in South Africa is primarily lower-quality domestic production that is not exported. Consequently, domestic consumption is closely tied to exports. For example, in 2005, domestic consumption of fresh oranges was estimated to rise by 20 percent, primarily because of an increased supply of lower-quality oranges that did not meet export market standards.[49] The export focus of the industry and income restraints are also factors in the negligible imports-to-domestic consumption rates for both oranges and lemons.

Pricing and Marketing

Domestic marketing channels are through the Commission Markets (wholesale-type markets focused primarily on bulk sales), and direct sales to retailers, wholesalers, and processors.[50] A majority of domestic fresh citrus is sold by means of the Commission Markets. There are 17 such markets throughout South Africa with the largest in Johannesburg and Pretoria. Independent agents that are permanently positioned within each Market sell the fruit in bulk quantities for producers. In the Tshwane Market in Pretoria there are eight such fruit agents. The Commission Markets provide the infrastructure and a variety of services to help streamline the process for a five percent surcharge. Increasingly, however, direct sales have become an important segment of domestic fresh citrus sales and currently account for one-fifth of domestic fresh market sales.[51]

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[45] This is primarily accomplished through the minimization of processed fruit in the domestic market mix.

[46] Interview with South African grower/packer, January 23, 2006, Mpumalanga, South Africa.

[47] Ibid.

[48] Latest available data includes fresh and processed products. FAOSTAT data aggregates orange consumption data with mandarins and lemon data with limes. However, based on South African production data, the reported per capita data is mainly oranges and lemons. FAOSTAT database (2005).

[49] USDA, FAS, *GAIN Report* No. SF5016, 6.

[50] Interview with South African government official, January 24, 2006, Tshwane, South Africa.

[51] Ibid.

Domestic prices are determined by supply and demand.[52] The largest factor in domestic supply is the amount of fruit that is non-exportable. The Commission Markets provide detailed reports on daily prices of fruit and vegetables sold in each market. These are published electronically, giving growers the ability to see current prices and to make alternative plans, such as direct sales, if they can receive higher prices. Monthly price averages from the Commission Markets are published by the South African Department of Agriculture (table 10-4). Domestic wholesale prices for oranges and lemons fluctuate throughout the year, peaking during the off season, March for oranges and January for lemons. Yearly average prices are collected and published by the CGA (table 10-5).

Table 10-4 Oranges and lemons: South African domestic monthly average prices, 2005 (US dollars/kg)

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Oranges	0.21	0.19	0.27	0.26	0.19	0.14	0.17	0.16	0.15	0.18	0.26	0.30
Lemons	0.28	0.34	0.26	0.20	0.16	0.17	0.17	0.20	0.26	0.26	0.32	0.36

Source: NDA.

Table 10-5 Oranges and lemons: South African average wholesale prices, 2000-2005 (US dollars/kg)

Item	2000	2001	2002	2003	2004	2005
Oranges	0.10	0.09	0.09	0.14	0.17	0.18
Lemons	0.15	0.14	0.15	0.21	0.21	([a])

Source: CGA.

[a]Data not available.

The South African citrus industry does not restrict domestic supply for price stabilization, nor does any domestic retail customer have significant purchasing power to influence prices. Internationally, however, the CGA helps to coordinate sales into different international markets to meet demands.[53] Quality control remains the primary method of ensuring high prices.

International Trade

Exports

Valencia oranges account for nearly half of all citrus exports. Navel varieties represent one-quarter of all citrus exports, followed by grapefruit (14 percent), easy-peelers (ten percent), and lemons and limes (nine percent).[54] South African exports of citrus, primarily oranges, account for nearly two-thirds of the industry's production volume and more than 90 percent of income for farms.[55] Due to a decrease in U.S. exports, South Africa overtook the United States as the second largest global exporter in 2005. Exports as a share of total production over the 2000-2005 period averaged 74 percent for oranges and 69 percent for lemons (tables 10-6 and 10-7). South African orange exports to the EU

[52] For citrus, sellers will compare available volumes in the local market where they operate, volumes available in other markets, national availability and take into account the quality of the fruit to determine market prices. On a monthly basis, the Markets compare a variety of factors including monthly prices, market share, growth, and performance.

[53] Exported citrus is sold in two primary fashions, direct sales to retailers abroad and by consignment.

[54] CGA, *Key Industry Statistics*.

[55] Interview with South African exporter, January 16, 2006, Western Cape, South Africa.

Table 10-6 Fresh oranges: South African imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2004

Year	Production[a]	Imports	Exports[b]	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	862	14	573	303	5	67
2001	1,024	5	751	278	2	73
2002	994	6	758	242	3	76
2003	974	6	744	238	3	76
2004	985	8	756	237	3	77
2005	913	8	703	218	4	77

Source: CGA, *Key Industry Statistics*.

[a]Production of fresh oranges.
[b]Exports based on CGA data, which vary from trade data reported by Global Trade Atlas elsewhere in this report.

Table 10-7 Fresh lemons/limes: South African imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production[a]	Imports	Exports[b]	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	76	([c])	60	16	([d])	79
2001	101	([c])	85	16	2	84
2002	109	([c])	91	24	([d])	75
2003	116	([c])	98	18	([d])	57
2004	121	0	102	19	0	51
2005	128	0	98	30	0	77

Source: CGA, *Key Industry Statistics*.

[a]Production of fresh lemons.
[b]Exports based on CGA data, which vary from trade data reported by Global Trade Atlas elsewhere in this report.
[c]Less than 500 mt.
[d]Less than 0.5 percent.

accounted for about one-half of all orange exports in 2004 with the Netherlands, United Kingdom, and Italy being major importers (table 10-8). Lemon exports are also primarily destined for Europe (39 percent), while a significant share are shipped to the Middle East. The United Arab Emirates, Saudi Arabia, and the United Kingdom are South Africa's three largest single country export markets (table 10-9).

Although they did not figure in the top markets for 2005, two other important markets for South African exports are Russia and the United States. Russia, considered a growth market, accounted for 11 percent of orange exports and 5 percent of lemon exports in 2004. The U.S. market, where 4 percent of total orange exports were shipped in 2004, provides the highest returns and is expected to be a growth market.[56] Other markets that pay premiums for high quality fruit include certain Asian markets, particularly Japan.[57]

[56] In 2005, the average unit value for orange exports to the United States, based on trade data, was $591/mt.
[57] Interview with South African exporter, January 16, 2006, Western Cape, South Africa.

Table 10-8 Fresh oranges: South African exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Netherlands	103,122	136,634	96,252	100,806	121,443	165,874
Hong Kong	30,714	42,955	49,615	37,050	35,691	110,430
United Kingdom	78,945	86,825	90,003	68,502	62,444	85,104
United Arab Emirates	28,239	39,331	30,509	37,675	30,194	70,336
Italy	6,796	19,981	26,610	26,830	29,894	62,547
Other	311,603	350,618	421,729	455,637	437,793	882,355
Total	559,419	676,344	714,718	726,500	717,459	1,376,645
	Value (1,000 dollars)					
Netherlands	21,686	23,054	20,923	27,868	42,747	44,656
Hong Kong	7,517	9,551	10,105	10,682	13,443	14,430
United Kingdom	17,592	18,399	18,439	22,011	25,080	28,736
United Arab Emirates	6,958	7,594	5,980	13,926	12,748	13,129
Italy	1,682	14,912	13,933	22,823	20,547	17,084
Other	80,250	64,360	71,724	122,625	159,249	150,218
Total	135,686	137,870	141,104	219,935	273,814	268,253
	Unit value (dollars per metric ton)					
Netherlands	210	169	217	276	352	269
Hong Kong	245	222	204	288	377	131
United Kingdom	223	212	205	321	402	338
United Arab Emirates	246	193	196	370	422	187
Italy	247	746	524	851	687	273
Other	258	184	170	269	364	170

Source: Global Trade Atlas.

Table 10-9 Fresh lemons/limes: South African exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
United Arab Emirates	10,374	10,945	12,027	14,780	14,062	88,640
Saudi Arabia	13,298	13,850	17,025	19,023	18,536	33,403
United Kingdom	9,800	8,020	9,245	15,769	10,986	24,596
Netherlands	4,444	8,509	5,079	5,892	10,027	21,239
Hong Kong	11,567	8,520	7,766	9,769	9,852	21,195
Other	46,835	42,524	41,003	80,778	65,900	238,808
Total	85,944	81,423	80,118	131,231	115,301	339,241
	Value (1,000 dollars)					
United Arab Emirates	2,704	2,954	2,887	6,238	6,638	8,392
Saudi Arabia	4,893	4,189	4,340	7,858	8,414	8,102
United Kingdom	3,131	2,612	2,184	6,164	6,290	7,600
Netherlands	1,252	2,569	1,240	1,851	4,989	5,722
Hong Kong	4,018	2,426	1,877	3,502	4,713	4,106
Other	3,663	7,139	7,133	22,995	25,173	26,073
Total	27,765	21,889	19,661	48,608	56,217	59,995
	Unit value (dollars per metric ton)					
United Arab Emirates	261	270	240	422	472	95
Saudi Arabia	368	302	255	413	454	243
United Kingdom	319	326	236	391	573	309
Netherlands	282	302	244	314	498	269
Hong Kong	347	285	242	358	478	194
Other	252	168	174	285	382	109

Source: Global Trade Atlas.

South Africa faces relatively low duties on its exports because of the counter-seasonal growing periods between itself and its main Northern Hemisphere markets. Even prior to the Africa Growth and Opportunity Act (AGOA), which grants duty free access to a number of South African products including citrus, U.S. duties on oranges and lemons were low.[58] The EU maintains higher seasonal duties,[59] which only affect the South African industry with early or late shipments according to industry officials. Russian duties on imports of South African citrus are not significant.[60]

Europe has become a mature market and significant increased growth in this market is not likely in the near term. According to exporters, the greatest potential for growth is in the Russian and Chinese markets. South Africa completed an SPS protocol with China in 2004 that enabled South Africa to begin exporting to China in 2005. However, such exports have been limited to certain accredited growers. "Blackspot-free" accredited areas of the Northern Cape also began exporting the United States for the first time and additional areas of the state began taking steps toward gaining accreditation from APHIS for citrus exports. Another potential export market, according to industry representatives, is India.[61]

Imports

The domestic industry is able to provide for a majority of the domestic citrus demand. Imports originate primarily from Zimbabwe and other neighboring countries (tables 10-10 and 10-11).[62] The Citrus Growers Association is also active in these countries to help promote exports of citrus from those regions. Zimbabwe experienced a major economic collapse in 2001 coinciding with abrupt land reform, which transferred most commercial farms from experienced owners to new owners with poor operating and managerial skills.[63] Since then production has begun to increase and the Citrus Growers Association has helped promote an export agent-grower profit sharing scheme aimed at increasing revenues and foreign exchange.

Competitive Factors

South Africa is highly competitive in world orange and lemon production despite high shipping and packaging costs and regulatory compliance requirements. Factors such as an excellent climate, modern technology both on-farm and in the export chain, and a very organized and independent group of industry associations with a research focus have driven this export oriented industry.

[58] Interview with South African exporter, January 16, 2006, Western Cape, South Africa.
[59] EU duties for fresh oranges are 3.2 percent from June 1 to October 15.
[60] Russian duties on fresh oranges and lemons are 5 percent.
[61] Interview with South African industry association representative, January 18, 2006, Western Cape, South Africa.
[62] Neighboring country imports are often sent through South Africa to take advantage of the better infrastructure for shipment to a third market.
[63] CGA, "CGA Zimbabwe Report."

Table 10-10 Fresh oranges: South African imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Zimbabwe	14,052	5,064	5,565	5,770	7,757	7,820
Israel	299	268	93	132	138	140
Spain	0	0	65	260	0	88
Zambia	0	0	0	0	30	0
Swaziland	0	0	0	95	0	0
Other	54	0	1	189	0	0
Total	14,405	5,497	5,724	6,447	7,925	8,048
	Value (1,000 dollars)					
Zimbabwe	151	34	18	21	65	69
Israel	166	137	39	75	84	86
Spain	0	0	39	168	0	80
Zambia	0	1	0	0	0	0
Swaziland	0	0	0	23	0	0
Other	7	15	0	89	3	0
Total	325	186	96	376	152	236
	Unit value (dollars per metric ton)					
Zimbabwe	11	7	3	4	8	9
Israel	557	511	422	567	607	615
Spain	([a])	([a])	600	646	([a])	910
Zambia	([a])	([a])	([a])	([a])	([a])	([a])
Swaziland	([a])	([a])	([a])	243	([a])	([a])
Other	132	94	([a])	468	6,602	([a])

Source: Global Trade Atlas.

[a]Not available.

Table 10-11 Fresh lemons/limes: South African imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Zimbabwe	56	303	80	17	0	0
Israel	5	0	0	0	0	0
Thailand	0	0	0	0	0	0
Taiwan	0	0	0	0	0	0
Russia	0	0	0	0	0	0
Other	1	0	0	0	0	0
Total	60	303	80	17	0	0
	Value (1,000 dollars)					
Zimbabwe	9	36	5	2	0	0
Israel	0	0	0	0	0	0
Thailand	0	0	0	0	0	0
Taiwan	0	0	0	0	0	0
Russia	0	0	0	0	0	0
Other	3	0	0	0	0	0
Total	12	36	5	3	0	0
	Unit value (dollars per metric ton)					
Zimbabwe	165	119	67	142	([a])	([a])
Israel	([a])	([a])	([a])	([a])	([a])	([a])
Thailand	([a])	([a])	([a])	([a])	([a])	([a])
Taiwan	([a])	([a])	([a])	([a])	([a])	([a])
Russia	([a])	([a])	([a])	([a])	([a])	([a])
Other	2,807	([a])	([a])	([a])	([a])	([a])

Source: Global Trade Atlas.

[a]Not available.

Natural Endowments

The Mediterranean/Cape climate, along the western and southern coasts, brings cool moist winters, while the subtropical climate along the eastern coast is characterized by mild to warm, but dry winters.[64] The Western Cape is also suitable for deciduous fruit production giving an advantage to grower packers who can minimize down time of packing houses and other large capital investments by utilizing them year round. Many areas of major citrus production are frost free, and frost prevention is not of concern to growers.[65] The coastal region, bordered by the Great Escarpment running from Namibia to southern Mozambique, is both the most fertile and wet area in South Africa.[66] The Limpopo and Mpumalanga states within the region have some of the most fertile lands in the world under citrus production. However, water in South Africa is extremely scarce in most regions. River flows are seasonal and limited, while ground water resources are limited by the hard-rock geology.[67]

Water Issues

Most citrus in South Africa is grown either in moderate rainfall areas or along major rivers. Water, however, remains a constraining resource to production. Water is rationed through a transferrable quota that can take over one year to obtain if not purchased with the entitled land. The importance of water rights is reflected in land values. Land in northern South Africa reportedly costs approximately $1,600-$2,400/ha with water rights compared to about $310/ha without water rights.[68] Citrus must be watered daily; to do this, some larger farms collect their own reserve cache of water behind small dams.

Pests and Diseases

South Africa has a wide range of pests and diseases.[69] The three main concerns to South African producers relate to export restrictions due to the presence of 1) citrus blackspot,[70] 2) false coddling moth and 3) fruit flies. According to industry statistics, pesticides run approximately 2.2 percent of costs or $436/ha.[71] With more stringent requirements of buyers regarding chemical usage and residues, South African producers are increasingly turning to integrated pest management schemes, which can reduce costs and increase revenues from higher valued pesticide-free citrus.[72] The cold storage chain has also become an important and necessary part of exports to protocol markets[73] by helping prevent the spread of these pests and diseases into the importers' own agricultural production. Cold storage, itself, costs approximately $12 per ton (1.9 percent of costs) according to industry statistics.

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[64] IMC, "About South Africa: Geography and Climate."

[65] Interview with U.S. government official, January 20, 2006, Mpumalanga, South Africa.

[66] UN FAO, "South Africa Country Pasture/Forage Resource Profiles."

[67] SAGI, "Water Affairs and Forestry."

[68] Interview with South African grower/packer, January 20, 2006, Mpumalanga, South Africa.

[69] Urquhart, "IPM and the Citrus Industry in South Africa," 4.

[70] With the exception of the Western Cape and portions of the Northern Cape, blackspot is prevalent throughout South Africa.

[71] According to South African grower/packers, pesticide costs for oranges are generally about 15 percent higher than for lemons. Additionally, northern South Africa faces greater pest pressures causing pesticide costs to rise to as much as $734/ha.

[72] Urquhart, "IPM and the Citrus Industry in South Africa."

[73] Markets with protocols concerning SPS include the United States, Japan, South Korea, China, European Union, and Taiwan.

Seasonality

The South African citrus season is counter-seasonal to that of the northern hemisphere. The season generally runs from the end of March to the beginning of October, as shown in the following tabulation:

Oranges and lemons: South African marketing seasons by variety, 2004

Variety	Marketing season
Oranges:	
Navels	mid-May to mid-September
Navelates	mid-June to mid-September
Late Navels	early July to late September
Valencia	mid-June to late November
Mid-Season	early June to early July
Midnights	early August to mid November
Lemons:	
Eureka Lemon	early March to late November

Source: CGA, *Key Industry Statistics*; USDA, FAS; and interview with South Africa's Citrus Research Institute (CRI), January 17, 2006, Western Cape, South Africa.

Production begins earlier in the northeastern part of the country progressing southwesterly towards the Western Cape. South Africa takes advantage of a number of navel and Valencia varieties to both diversify and extend the season. Because of the long yielding season of lemons and lower revenue compared to oranges, lemons are grown primarily to provide an extended marketing period for the grower/packer.

Labor

Like many global producers, South Africa faces a scarcity of labor. Producers reportedly have difficulties filling seasonal positions despite high unemployment rates. Two factors reportedly contribute to this: 1) South Africa's negative population growth rate owing mainly to its 20 percent HIV/AIDS rate[74] and 2) the undesirability of labor intensive jobs such as those in the citrus industry. Seasonal employees sometimes do not return year to year and have little or no schooling, making annual training necessary. Some farms still find contract labor politically sensitive[75] and perform all hiring on an individual basis, but some are now beginning to use contract work to reduce costs.[76] The minimum wage is set at $5.97 per day, but many farmers give incentive based wages up to $20.10 per day for pickers.[77] Farms have seen a downward trend in recent years in worker productivity from 1.8 mt of oranges per day per picker to about 1.0 mt per day per picker. Lemon picking productivity reportedly has also decreased.[78]

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[74] CIA, *World Fackbook*.
[75] The use of contract labor is associated with apartheid for some South Africans.
[76] Instead of hiring all workers through the farm's own hiring staff, the farm hires a single contractor who in turn hires all the contract labor and is in charge of the workers after work hours.
[77] Interview with South African grower/packer, January 23, 2006, Mpumalanga, South Africa.
[78] Ibid.

Land

Land and labor are important issues in South Africa in the post-Apartheid political atmosphere. Land sales, worker training, and employment/ownership options have been particularly affected. Land reform requires that 30 percent of the white-owned agricultural land revert back to disadvantaged groups. Land reform has indirectly led to a lack of investment and entrepreneurs seeking out new businesses due to the insecurity of land and water rights.[79] To date only three percent of this land has been officially transferred.[80] Unofficially, about ten percent has been transferred when accounting for informal and private deals.[81] Of the 100.6 million hectares of suitable land in South Africa in 2005, 18.6 million hectares are not farmed, 79.5 million hectares are farmed by white owners, and 2.5 million hectares are being farmed by black owners.[82] Many land-owners see that once a land claim has been made, it becomes much harder to sell the land for purposes of commercial agriculture. Land and ownership transitions under the land reform program have left many commercially viable farms underutilized because of the education and skills levels of new owners, as well as the communal nature of land ownership under the reform program.[83]

Cultural Practices

Irrigation technology is typically installed with new plantings. According to industry representatives, orchard establishment costs range between $6,289 and $11,006/ha with variation partly attributable to irrigation costs.[84] Density is also a function of irrigation methods. As older irrigation technologies are replaced with new drip irrigation, tree density can be raised to increase efficiency of water use. Trees are spaced every 2 meters with 6 meters between rows on average, giving a density of 666 trees per hectare.[85] Representatives also stated that on average between 3-4 percent of orange and lemon orchards should be replanted annually, given an optimal replacement age of 35 years.

As an export oriented-market, most South African citrus producers implement cultural practices in response to the quality, safety, agricultural practices requirements in the importing countries. Much effort and investment has been taken to provide full traceability of fruit,[86] limit chemical usage through integrated pest management, and other measures to

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[79] Interview with South African academic, January 17, 2006, Western Cape, South Africa.

[80] EIU, *Country Report: South Africa 2005*, 24.

[81] Interview with South African academic, January 17, 2006, Western Cape, South Africa.

[82] EIU, *South African Country Profile 2005*.

[83] Interview with U.S. embassy official, January 23, 2006, Mpumalanga, South Africa. The Black Empowerment Entitlement Act (BEE) strives to rectify past inequalities through generation of equitable access to infrastructure, land, inputs, financing, expertise, training, and marketing for the previously disadvantaged. The BEE works by requiring all members of a sector to pay a levy, which is then used help finance BEE programs that are implemented by individual businesses. The BEE is supplemented on a voluntary basis with industry specific programs, such as the AgriBEE. These sector programs give direction and targets to businesses/farms for meeting BEE goals. The AgriBEE has not been finalized but a framework was drafted in July 2004. See: Sanlam Group, “What is AgriBEE?”

[84] Interview with South African grower/packer, January 16, 2006, Western Cape, South Africa.

[85] Interview with South African grower/packer, January 16 and 20, 2006, Western Cape and Mpumalanga, South Africa. Newer orchards can reach 830 trees/ha according to industry representatives.

[86] Traceability is being driven by consumer demand for chemical free or low level chemical application and the domestic industry’s desire for accountability and ease of isolation of contaminated fruit.

meet sanitary and phytosanitary restrictions.[87] All export oriented producers are compliant with EurepGAP and U.S. standards.

Production Technology

The citrus export production chain is highly advanced and makes use of most modern technology. Computerized fertigation has come to predominate in South African orchards. Advanced computer technology is also used to provide digital access to production records on a per field basis and to remotely apply fertigation. Packing houses also make use of modern technologies. Computerized sensors sort fruit by characteristics predefined for different export markets. Packing materials are a major cost to growers/packers and represent approximately 12.6 percent of total costs from grower to retail. Equally expensive are other packing costs, which run approximately 13 percent of total costs or $1.34 per 15kg carton.

Perishability and phytosanitary concerns play key roles in the importance of the need for cold storage and refrigerated transport. Fruit is either pre-cooled at the packing house or shipped to port at ambient temperatures to be cooled or packed directly into cold store containers ready for immediate placement on ships. Upon leaving the packing house, fruit is tracked by bar code. Ports monitor incoming shipments and can divert traffic to nearby cold stores, if necessary.[88] Once at port, fruit is placed in separate cold storage rooms based on destination to prevent contamination, and wireless technology and bar codes are used to continually monitor the location and temperatures of pallets.

Government Policies and Support

Government assistance to the South African citrus industry is minimal. The government established an industry financed levy on citrus production to fund the CGA. Other government activities are limited to such areas as phytosanitary regulations and trade negotiations.

Regulatory Compliance

Export standards dominate regulatory compliance in the South African citrus industry. These standards, often in the form of protocols, reflect the pests and diseases of most concern to an importing country.[89] The National Department of Agriculture (NDA) published food safety regulations effective in 2005, which include Good Agricultural Practices (GAP) and Good Management Practices (GMP). The Perishable Produce Export Control Board (PPECB),[90] South Africa's statutory organization for quality certification, performs audits once every 3 years to ensure compliance.[91] Additionally, the NDA instituted, through the CGA, a mandatory product tracking system in 2005, as previously discussed.

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[87] Markets include the United States, European Union, Japan, Korea and China.

[88] In 2003, South Africa had 300 registered cold stores for all fruit. See: van dyk, "An Analysis of the South African Fruit Logistics Infrastructure," 5.

[89] For example, blackspot is not of concern in the EU, due to the inability of the disease to establish there, while the U.S. protocol for blackspot is extensive and extremely restrictive.

[90] The PPECB provides the perishable fruit industry with quality certification and cold chain management services. See: PPECB, "About PPECB."

[91] Farms certified with EurepGAP can apply for exemption from inspection/audit. See: van dyk, "An Analysis of the South African Fruit Logistics Infrastructure."

PPECB funding is provided through a statutory levy of R 7/mt (about $1.1/mt). PPECB inspectors work alongside, but separately from private inspectors in the packing house and foreign inspectors at port. The packing house owners' inspectors ensure fruit quality (i.e. acidity and sugars), while PPECB inspectors ensure quality based on export standards (i.e. color, size, and SPS) and also supervise and initiate the cold treatment process.[92]

Where protocols permit, pre-clearance inspections are carried out by foreign inspectors, such as APHIS, ensuring acceptance into the importers' market upon arrival. This prevents rejection after shipment has occurred, allowing the exporter to either repackage the product for an export market that will accept the fruit or sell it domestically. Since 1999, South Africa has successfully minimized rejections/interceptions of product going into several of its key markets including the European Union and the United States.[93] The South African Deciduous Fresh Produce Trust (DFPT) funds the pre-clearance inspectors travel, expenses, and wages for approximately six to eight weeks per annum through a levy. Given U.S. export volumes, the APHIS pre-clearance inspections program is the least expensive, $0.44 per 15kg carton, while the Korean program is the most expensive.[94]

Most of South Africa's protocols require cold storage to guard against pest and diseases. Cold storage costs are estimated at two percent of total costs ($0.20 per 15kg carton). Cold storage can negatively affect fruit quality, especially lemons.[95] With the recent increase to 24 days of cold treatment for several export markets,[96] many exporters feel their lemons will simply not be able to retain a high enough quality to gain the return necessary to make the transaction profitable.[97]

Business Climate and Investment

Between the Rand strengthening and the weakening of the U.S. dollar, the South African citrus industry has benefitted overall from both cheaper input supplies and lower interest rates, making borrowing for investment easier.[98] However, a strong Rand has decreased the industry's competitiveness internationally by making citrus exports more expensive abroad. The value of the Rand has doubled from about R12 per $1 in 2002 to roughly R6 per $1 in 2005-2006. In 2003, the Rand experienced some weakening causing an increase in costs of inputs, such as diesel, fuel, fertilizers, and herbicides, which rose by 23 percent and transportation costs which rose by 14 to 18 percent.[99] Despite a strengthening of the Rand, the price of some imported inputs have reportedly remained unadjusted.[100]

Deregulation brought in several large multinationals as export agents, which have vertically integrated and now own packing houses and have begun their own production. Re-investment of profits has been extensively used by the industry to increase returns (i.e.: new plantings, new technology, research, industry organization). Many orchards did not maintain a regular orchard replanting scheme or other investments in future productivity prior to

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[92] Interview with U.S. government official, January 16, 2006, Western Cape, South Africa.
[93] CGA, *Annual Report*.
[94] Interview with U.S. government official, January 16, 2006, Western Cape, South Africa.
[95] Interview with South African government official, January 24, 2006, Pretoria, South Africa.
[96] United States, China, and Korea requested extension to 24 days of cold treatment.
[97] Interview with South African government official, January 24, 2006, Pretoria, South Africa.
[98] Interest rates have declined from 15–9.5 percent and inflation from 9–3.5 percent between 2002 and 2005.
[99] USDA, FAS, *GAIN Report* No. SF5039, 10.
[100] Interview with South African grower/packer, January 23, 2006, Mpumalanga, South Africa.

deregulation. Greater competition within the industry, as a result of deregulation, forced growers to invest in their orchards.

As a whole, the agricultural sector is a net borrower receiving credit from six primary sources: 1) banks, 2) agricultural co-operatives and agribusinesses, 3) the Land Bank, a private bank that provides specialized financing for the agricultural sector, 4) private creditors, 5) other creditors and financial institutions, and 6) the South African government.[101]

Alternative Crops

Citrus production remains an integral part of South African agriculture. In 2003, citrus was the sixth largest agricultural industry, by gross value of production, behind poultry, maize, cattle, deciduous fruits and vegetables and closely followed by fresh milk, sugar cane, and viticulture.[102] Alternative land usage differs by region and climate.

In the Western Cape, wine grapes and other deciduous fruit are the main alternatives to citrus. Within the citrus sector, easy-peelers are the major alternative to navels and lemons. Conversion of orchards to wine grape vineyards has slowed in recent years because of changes in the wine industry.[103] In the Northern Cape along the Orange River table grape production is beginning to be converted to citrus production. This shift is due in part to the high APHIS rejection rates of organic table grapes and also the prospect of the area being designated “blackspot-free” by APHIS. This would be the first South Africa region which could grow grapefruit for export to the United States, but oranges will be viable here also.[104] To the east, in the more tropical climate, production alternatives include sugar, bananas, sub-tropical fruit and certain nuts. Within citrus production, grapefruit and Valencia oranges are the major alternative to navels and to a lesser degree, lemons.

Costs of Production

Available cost information was compiled by the Commission using survey information from South Africa’s CGA. These data are an average of survey information from participating CGA members, representing export-oriented firms in the southern part of the Western Cape, and are considered representative of the industry as a whole.[105] Data were provided by CGA on a 15-kilogram carton basis in South African Rand, and were converted using a per-hectare conversion rate based on available 10-year average data, as provided by the CGA.[106] These cost data are corroborated by other supplemental cost information received by Commission staff through fieldwork and interviews with South African citrus industry representatives, consisting of both actual costs and also targeted costs for facilities located in the Mpumalanga province. Available shipping cost information is based on actual and target

[101] SAGI, “Agriculture and Land Affairs.”

[102] Ibid.

[103] Interview with South African industry association representative, January 17, 2006, Western Cape, South Africa.

[104] Interview with South African grower/packer, January 20, 2006, Mpumalanga, South Africa.

[105] The survey is compiled primarily from the four largest producers in the Western Cape, representing over 50 percent of citrus production.

[106] Email correspondence with South African citrus growers association representatives, March 24, 2006. Specifically, 15kg cartons of navels are equivalent to 1,890 cartons/ha or a yield of 30 mt/ha.

costs to export citrus to the United States and Europe. Cost data reflect production conditions in 2005.

Total Costs

Total farm-level production costs for growing oranges in the Western Cape average approximately $4,175/ha, or about $139/mt in 2005 (table 10-12). Packing and marketing costs add another $192/mt in costs, and include packing costs and materials, marketing, transport, and inspection expenses. Given South Africa's export-orientation, available citrus product costs include export costs, estimated at about $175/mt.[107] These cost data are considered to reflect average growing and packing conditions at South African citrus operations, regardless of the variety of citrus produced.[108] Total average costs for South African citrus for export are estimated at about $500/mt, based on these reported cost data.

Major Costs Components

Farm-level costs account for nearly 30 percent of total citrus product costs. Labor costs account for the largest share of growing costs, one-third, including seasonal and year round employees, and management salaries. Labor costs have doubled over the past 10 year period from a low base level due in part to new minimum wage and related benefits legislation.[109] The minimum wage is set at about $6 per day, however, some incentive-based schemes exist in the citrus industry that may raise worker wages raise wages up to $20 per day.[110] Chemical inputs, including pesticides and fertilizers, account for another 19 percent of farm-level costs. Reported costs are about $436/ha for pesticides and $342/ha for fertilizers (table 10-12). Cost information for northern South Africa indicate differences in these costs, with fertilizer costs ranging from $470-$550/ha for oranges and about $990/ha for lemons, and pesticide costs at about $1,100-$1,300/ha.[111]

Overhead, depreciation, and administrative costs account for another 32 percent of farm-level costs. It is not clear whether these reported costs include land costs. Current land values in the Western Cape growing area are estimated at about $23,000/ha for a well-established orchard; land values in the Northern Cape are about $11,000/ha.[112]

Marketing and packing accounts for nearly 40 percent of total citrus product cost. High packing costs reflect high costs of packing and packing materials, in part, because of high import duties on packing materials[113] and may also reflect a strong South Africa currency in recent years.[114] Shipping and storage account for the remaining roughly one-third of South

[107] These costs were adjusted from the original data by Commission staff to reflect transportation to port only, and to remove fees to importers and marketers. Promotion costs are also excluded. All adjustments are based on information obtained from South African industry representatives., January 18, 2006, Durban, South Africa.

[108] Interview with South African citrus growers association representatives, January 18, 2005, Durban, South Africa. South African growers/packers indicate possible differences in the cost for fertilizer application, picking and pruning.

[109] Interview with South African grower/packer, January 23, 2006, Mpumalanga, South Africa.

[110] Ibid.

[111] Ibid.

[112] Interview with South African exporter, January 16, 2006, Western Cape, South Africa.

[113] South Africa maintains a 7 percent tariff on imports of some production inputs.

[114] Credit Guarantee, "An Export Perspective of the Fruit Industry in South Africa," 6.

Table 10-12 Oranges: South African costs of production and cost shares, 2005

Cost component	Value (dollars/ha)	Value (dollars/mt)	Value (dollars/15 kg export carton)	Share of total (percent)
Farm-level costs:				
Fertilizer	342	11	0.2	2
Pesticides	436	15	0.2	3
Labor costs, salaries	1,123	37	0.6	7
Water	9	0	0.0	0
Electricity, fuel	913	30	0.5	6
Depreciation, admin, other	1,352	45	0.7	9
Total, farm-level costs	4,175	139	2.2	28
Packing house costs:				
Transport, inspection	670	22	0.4	4
CGA/CSA levies	91	3	0.0	1
Packing material	2,461	82	1.3	16
Packing costs	2,525	84	1.3	17
Total, packing costs	5,746	192	3.0	38
Total, farm and packing costs	9,921	331	5.2	65
Export costs:				
Cold storage	366	12	0.2	2
Documentation	219	7	0.1	1
Other land costs	1,270	42	0.7	8
Commission payable to exporters[a]	1,023	34	0.5	7
Customs, inspection, expedite	667	22	0.4	4
Handling and storage	1,597	53	0.8	11
Freight to port[b]	100	3	0.1	1
Total, export costs	5,243	175	2.8	35
Total product costs	15,164	505	8.0	100

Source: Compiled by Commission staff using cost information for oranges grown in the Western Cape, obtained from South African citrus industry officials based on surveyed information compiled by the Citrus Growers Association. Information was provided on a "per 15kg carton" basis and converted to a "per hectare" basis assuming navel yields of 30 mt/ha or 1,890 (15kg) cartons per hectare (rates provided by industry representatives using 10 year averages). Converted to U.S. dollars by Commission staff assuming 2005 nominal exchange rate ($1 = 6.46Rand).

Note: Some of the export values were adjusted by Commission staff to reflect free on board value.

[a]Commission staff adjusted reported commissions payable by removing fees to importers and marketers, using information based on Commission staff interviews with South African industry representatives. Promotion costs are also excluded.

[b]Commission staff adjusted reported freight costs to reflect transportation to port only, using information based on Commission staff interviews with South African industry representatives. The original CGA-reported costs reported freight costs assuming export to the United States, which reflects the highest costs possible freight costs given the distance between two countries.

Africa's citrus industry costs.[115] Given South Africa's dependence on exporting citrus, high shipping costs may inhibit export expansion into certain markets.[116] For example, shipping costs to the United States would add another estimated $620/mt (or $9.32 per 15kg unit) to overall costs.[117] Shipping costs to Europe are approximately 60-70 percent of shipping costs to the United States.

[115] The original CGA-reported costs included freight costs assuming export to the United States, which reflects the highest costs possible freight costs given the distance between two countries. For comparison purposes with costs reported for other countries in this study, reported South African citrus export costs have been adjusted by Commission staff to reflect costs for delivery to port.

[116] Interview with South African exporter, January 16, 2006, Western Cape, South Africa.

[117] Ibid.

CHAPTER 11
Spain

Introduction

Spain is a leading grower of citrus fruit with a longstanding history of citrus production. Globally, it is the 5th largest producer of oranges and the 3rd largest producer of lemons. Overall, the citrus industry is geared toward the fresh market, with only 15 percent of production sent for processing. Spain is the leading world exporter of both navel oranges and lemons and maintains an export orientation, mainly to other EU countries. Navels account for 40 percent of citrus exports by value and surpassed clementines for the first time in 2004. Competitive advantages include suitable growing conditions and proximity to key markets. Competitive disadvantages include lack of water and certain phytosanitary issues.

Industry Overview

Production Trends

Spain's citrus production expanded over the past decade, rising from about 5.0 million mt in the mid-1990s to nearly 6.3 million mt in 2003.[1] However, in 2004-2005, Spain's overall citrus production dropped sharply because of both record-setting cold temperatures in the late part of the growing season[2] and Spain's worst drought in 60 years. Projected 2005 citrus production is estimated at about 5.3 million mt, with orange production reported at about 2.3 million mt and lemon production at 0.9 million mt (tables 11-1 and 11-2).[3] Spain's citrus production generally consists of roughly 40 percent each of oranges and tangerines, and about 20 percent lemons, with under one percent other types of citrus fruit.

Table 11-1 Oranges: Spanish production volume, value, area and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	2,616	2,898	2,963	3,052	2,691	2,260
Production value (1,000 US dollars)	361	500	577	657	733	([a])
Bearing hectarage (1,000 hectares)	120	125	121	124	135	([a])
Nonbearing hectarage (1,000 hectares)	14	13	14	13	15	([a])
Total hectarage (1,000 hectares)	135	138	135	137	150	([a])
Annual yield (mt/hectares)	22	23	24	25	20	([a])

Source: MAPA, "Cítricos;" USDA, FAS, PSD data. New post estimate (2005), as of November, 2005.

[a]Data not available.

[1] FAOSTAT data (2006).
[2] USDA FAS, "World Horticultural Trade & U.S. Export Opportunities."
[3] USDA, FAS, *GAIN Report* No. SP6013.

Table 11-2 Lemons: Spanish production volume, value, area and yields, 2000-2005

Item	2000	2001	2002	2003	2004	2005
Production volume (1,000 mt)	915	1,024	994	1,130	729	890
Production value (1,000 US dollars)	195	218	227	321	233	([a])
Bearing hectarage (1,000 hectares)	44	45	45	46	42	([a])
Nonbearing hectarage (1,000 hectares)	2	2	2	2	2	([a])
Total hectarage (1,000 hectares)	46	48	47	47	45	([a])
Annual yield (mt/hectares)	21	23	22	25	17	([a])

Source: MAPA, "Cítricos;" USDA, FAS, PSD data. New post estimate (2005), as of November, 2005.

[a]Data not available.

Prior to 2004, Spain's orange production had been expanding steadily to meet growing demand, especially navel production (table 11-3).[4] The principal varieties of oranges grown in Spain are divided into two categories: navels (consisting of Navelinas, Newhall, Washington Navel, Navelate, and Lane Late) and blancas (Salustiana and Valencia Late). Spain's lemon production has been more variable, reflecting increased competition from Turkish and Argentine lemon producers, and a record setting crop in 2003 followed also by a sharp decrease in production during 2004 and 2005 (table 11-2).[5] Production of lemons increased in 2003 as new lemon varieties came into production. Spain's primary varieties are Verna and Fino. The Verna variety is not typically grown outside Spain. Fino production has overtaken Verna over the past decade as Spanish producers try to remain competitive with South American lemon producers[6] because the Fino variety is of a higher quality and arrives on the market earlier than the Verna.[7]

Table 11-3 Oranges: Spanish production by variety, 2000-2005 (mt)

Variety	2000	2001	2002	2003	2004	2005
Navelina-Newhall	1,095	1,152	945	1,214	1,233	1,007
Valencia Late	546	527	382	511	577	504
Navelate-Lanelate	341	353	232	445	516	514
Navel	346	325	170	302	283	246
Berna	30	28	4	25	30	22

Source: Intercitrus, "Producción de Cítricos en España." Includes other orange varieties.

Note: Data provided are based on growing season of September 1-August 31.

Growing Regions

Citrus production in Spain is centered in the eastern and southern coastal regions of the Mediterranean and along the Quadalavir River basin (figure 11-1 and the following tabulations):

[4] Email interview with Spanish trade association representative, April 4, 2006, Washington, DC.
[5] "Spain's Lemon Crisis," *Fresh Produce Journal*; van der Wiel, "Spain: Record Harvest."
[6] USDA, FAS, *GAIN Report* No. SP5040.
[7] van der Wiel, "Spain: Record Harvest."

Oranges: Spanish production by region, 2004 (1,000 mt and percent share)		
Region	2004	Share
Valencia	1,743	58
Andalucia	991	33
Murcia	179	6
Cataluna	41	1
Baleares	19	1
Others	27	1
Total	2,999	100

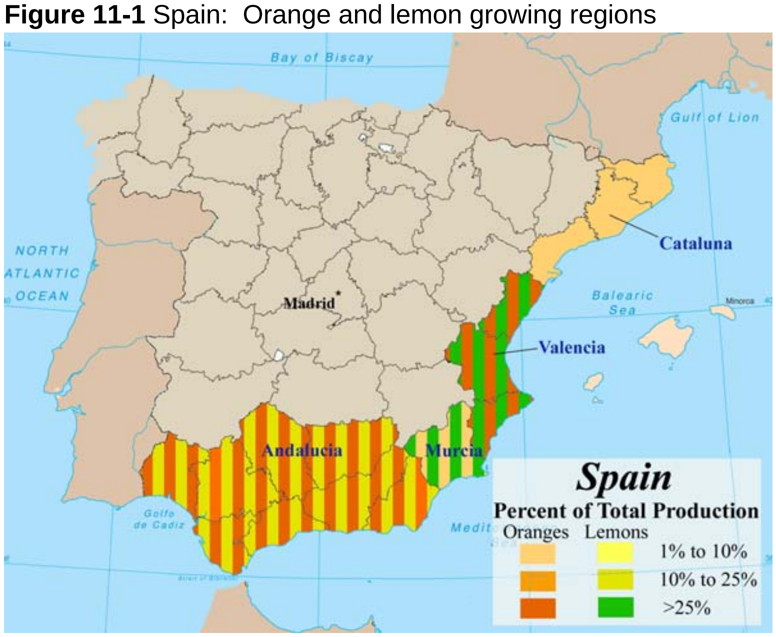
Source: Intercitrus, "Producción de Cítricos en España." Data provided based on growing season of September 1-August 31, and may differ from production information reported by other sources.

Lemons: Spanish production by region, 2004 (1,000 mt and percent share)		
Region	2004	Share
Murcia	545	51
Valencia	348	33
Andalucia	159	15
Baleares	2	([a])
Cataluna	1	([a])
Others	11	1
Total	1,065	100

Source: Intercitrus, "Producción de Cítricos en España." Data provided based on growing season of September 1-August 31, and may differ from production information reported by other sources.

[a]Less than 1 percent.

Figure 11-1 Spain: Orange and lemon growing regions



Orange production is located mainly in Valencia (58 percent), while the lemon industry is centered in Murcia (51 percent). Valencia is the largest orange growing region in Spain due to its conducive climate and historical tradition of citrus production. Orange production, particularly navels, is increasing in the Andalucia region (up 26 percent since 2000), owing to the expansion of large-scale commercial citrus farms (on average, larger than 100 hectares), often at the expense of tobacco and cotton production.[8] Andalucia is an important orange production region because of its climate and rainfall, while cooler Valencia is better for mandarin production.[9] Expansion of production in Andalucia is expected to continue as the EU's reform of cotton subsidies likely will lower direct payments to cotton farmers and raise horticulture production, such as oranges.[10] Murcia remains the center of lemon production in Spain due to its climate and year-round production.

Structure and Organization

A majority of Spain's citrus producers (up to 90 percent in Valencia) are part-time farmers.[11] Many of these farms have very small plot sizes (averaging 1-2 hectares), as land has been passed down over generations and divided among descendants. To compensate for the small size and predominance of part-time farming, farmers are organized into larger groups, particularly through cooperatives, which are an integral part of Spanish citrus production. According to a 1999 survey, there were 132,825 orange farms and 33,350 lemon farms in Spain.[12]

There are a number of large citrus cooperatives in Spain that organize the harvest, distribution, and marketing of citrus. For example, the largest citrus cooperative, Anecoop, handles almost 70 percent of the citrus production in Valencia (and 30 percent of all citrus production in Spain) and integrates many other small cooperatives (98 in total).[13] A majority of Spanish citrus is purchased "on the tree" by either the cooperative or packing house that organizes the harvest of the citrus fruit and is responsible for any picking/harvesting/freight costs.[14] Additionally, many orchards are managed by small local cooperatives that pool resources, such as labor and machinery, across the many small farms in their region.

An important component of the Spanish citrus industry are Producer Organizations (POs), groups of producers organized to coordinate marketing and production activities.[15] Members are obligated to market their entire production through the PO. In 2004, nearly 40 percent of Spanish fruit and vegetable production was sold by producers through a PO.[16] The advantage to membership in a PO is that most of the EU agriculture budget is dispensed through these organizations.

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[8] Correspondence with U.S. embassy officials, November 2005-January 2006; Arnalte and Ortiz, "Some Trends of Spanish Agriculture."

[9] Email interview with Spanish trade association representative, April 4, 2006, Washington, DC.

[10] USDA, FAS, *GAIN Report* No. SP4026.

[11] Arnalte and Ortiz, "Some Trends in Spanish Agriculture."

[12] UN, FAO, "Spain - Agricultural Census 1999." Farms with small holdings (under 1 hectare) were not included in the survey, so these reported numbers may underepresent the actual number of citrus farms in Spain.

[13] Correspondence with U.S. embassy officials, November 2005-January 2006.

[14] Ibid.; Gallasch, Damiani, and Falivene, "Citrus Growing in Spain."

[15] For instance, Anecoop is also a producer organization.

[16] EC, "Analysis of the Common Market Organization in Fruit and Vegetables," 13.

There are numerous other industry organizations in Spain which provide support and assistance to Spanish citrus growers, most importantly Comité de Gestion de Cítricos,[17] Intercitrus,[18] and Ailimpo.[19] Both Intercitrus and Ailimpo are officially recognized organizations of the EU and their aim is to aid production and marketing of citrus in a more general way than producer organizations.

Market Overview

Production Utilization and Domestic Consumption

Citrus fruit grown in Spain is primarily for the fresh market as only 15 percent of citrus is processed.[20] Spain has one the highest rates of consumption of fresh citrus in Western Europe, with consumption of fresh oranges estimated at 23.5 kg/person and consumption of fresh lemons estimated at about 7.5 kg/person per year in 2005.[21] About 30-50 percent of Spanish orange and lemon production is consumed within Spain.[22] The remaining 50-70 percent is exported (tables 11-4 and 11-5), predominately to other EU countries. Spain imports a small amount of citrus, mainly to supplement production during its off-season.

Table 11-4 Oranges: Spanish imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	2,616	79	1,419	1,276	6	54
2001	2,898	184	1,332	1,750	11	46
2002	2,963	100	1,583	1,480	7	53
2003	3,052	154	1,511	1,695	9	50
2004	2,691	167	1,521	1,337	12	57
2005	2,260	160	1,116	1,304	12	49

Source: Global Trade Atlas and MAPA data.

Table 11-5 Lemons: Spanish imports for consumption, domestic production, exports, apparent consumption, ratio of imports to consumption, and ratio of exports to production, 2000-2005

Year	Production	Imports	Exports	Apparent consumption	Ratio of imports to consumption	Ratio of exports to production
	1,000 metric tons				Percent	
2000	915	26	513	428	6	56
2001	1,024	39	519	544	8	51
2002	994	41	560	475	9	56
2003	1,130	63	519	674	9	46
2004	729	37	538	228	16	74
2005	890	86	362	614	14	41

Source: Global Trade Atlas and MAPA data.

[17] For more information, see *http://www.cítricos.org/cítricos/intro.asp*.
[18] For more information, see *http://www.intercitrus.org*.
[19] For more information, see *http://www.ailimpo.com*.
[20] MAPA, "Cítricos."
[21] USDA, FAS, *GAIN Report* No. SP5040, 6 and 9. Lemon per capita consumption calculated by Commission staff from reported total fresh domestic consumption.
[22] MAPA, "Cítricos."

Pricing and Marketing

Pricing for citrus fruit in Spain is competitive and not dictated by the larger cooperatives or packing houses. Private traders representing large packing houses visit local growers and make pricing offers for their fruit crop. Most citrus fruit in Spain is purchased "on the tree." When presold, growers are paid 10-20 percent of the value of their fruit soon after flowering. If the prices offered by the traders are not high enough, farmers will sell their fruit to the cooperative; typically more than 50 percent of Spanish citrus is sold to the cooperatives.[23] Once harvested, the fruit is then transported and packed by the packing house and sold to a distributer who then markets the fruit. Prices received by farmers can be very low in comparison to the final sales price of the fruit. The largest margin in terms of input-cost to sales-cost is received by 5-6 large commercial retailers that dominate the market for Spanish citrus in the European Union.[24] Recent prices for lemons published by the Spanish Ministry of Agriculture, Fisheries and Food (MAPA) show that farm prices for lemons are $0.12 per kg while retail prices are $1.75 per kg.

Prices in the Spanish domestic fresh orange and lemon market increased between 2000-2005 (tables 11-6 and 11-7). Seasonal prices fluctuate substantially. Prices peak during March and April, when domestic supplies are low. Conversely, the lowest price occurs in December and January, during peak season for citrus fruit in Spain. Spain's citrus industry conducts extensive marketing and promotional campaigns, particularly to other EU countries. The most recent initiative funded by the EU, MAPA, and Intercitrus is targeted to the new EU member states.[25]

Table 11-6 Oranges and lemons: Spanish average annual prices, 2000-2005 (US dollars/kg)

Item	2000	2001	2002	2003	2004	2005
Orange	0.14	0.18	0.19	0.22	0.25	0.26
Lemon	0.21	0.21	0.23	0.28	0.26	0.31

Source: MAPA.

Table 11-7 Oranges and lemons: Spanish monthly prices, 2005 (US dollars/kg)

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.
Orange	0.19	0.25	0.32	0.33	0.27	0.19	0.23	0.26	0.27	0.27	0.27	0.23
Lemon	0.22	0.29	0.46	0.39	0.30	0.30	0.32	0.30	0.33	0.32	0.26	0.18

Source: MAPA.

International Trade

Exports

The majority (roughly 95 percent) of Spanish orange and lemon exports remain within the European Union (tables 11-8 and 11-9). The largest individual EU markets are France and Germany. Exports outside the EU totaled under 100,000 mt, or about 5 percent of total

[23] Correspondence with U.S. embassy officials, November 2005-January 2006.
[24] Correspondence with U.S. embassy officials, November 2005-January 2006.
[25] Intercitrus, "A Campaign Full of Development."

Table 11-8 Fresh oranges: Spanish exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
			Quantity (metric tons)			
EU-25[a]	1,335,450	1,253,923	1,495,036	1,437,846	1,441,820	1,056,582
Switzerland	25,581	22,366	24,819	27,437	29,511	24,246
Norway	21,248	21,128	23,736	23,066	26,797	18,462
Croatia	7,281	4,466	7,889	7,895	9,703	6,663
Other	29,772	30,106	31,918	14,879	12,728	10,321
Total	1,419,332	1,331,989	1,583,398	1,511,123	1,520,559	1,116,274
			Value (1,000 dollars)			
EU-25	562,461	608,665	810,881	962,034	1,106,062	826,086
Switzerland	11,795	11,922	14,570	19,295	23,502	20,465
Norway	9,101	9,615	11,555	14,066	17,719	14,193
Croatia	1,905	1,314	2,450	3,329	5,196	3,826
Other	12,107	12,917	14,722	7,739	7,497	6,856
Total	597,369	644,433	854,179	1,006,462	1,159,976	871,426
			Unit value (dollars per metric ton)			
EU-25	421	485	542	669	767	782
Switzerland	461	533	587	703	796	844
Norway	428	455	487	610	661	769
Croatia	262	294	311	422	536	574
Other	407	429	461	520	589	664

Source: Global Trade Atlas. Assumes all 25 member countries throughout 2000-2005.

[a]Data reflect official EU-25 data after expansion on May 1, 2005. Prior to this date, the data are combined with the external trade data (trade with non-EU-15 members) of the 10 new member states.

Table 11-9 Fresh lemons/limes: Spanish exports by market, 2000-2005

Country	2000	2001	2002	2003	2004	2005
			Quantity (metric tons)			
EU-25[a]	444,985	437,371	472,141	432,256	441,530	335,531
Switzerland	11,602	10,437	9,860	9,392	8,141	7,087
Russia	23,654	39,653	34,318	47,706	50,115	6,948
Croatia	4,845	4,219	5,012	5,518	5,810	3,142
Norway	2,238	2,154	1,973	2,194	2,437	1,995
Other	25,478	25,368	36,641	21,661	29,997	25,478
Total	512,802	519,202	559,945	518,727	538,030	361,759
			Value (1,000 dollars)			
EU-25	224,018	212,963	240,100	285,583	302,385	261,936
Switzerland	5,452	4,812	5,652	7,302	7,560	7,053
Russia	10,652	17,416	14,186	26,606	30,900	4,801
Croatia	1,550	1,424	1,838	2,939	3,453	2,240
Norway	1,119	1,089	1,052	1,591	1,757	1,819
Other	9,609	10,271	15,893	9,642	13,489	3,577
Total	252,400	247,976	278,721	333,664	359,542	281,426
			Unit value (dollars per metric ton)			
EU-25	503	487	509	661	685	781
Russia	470	461	573	777	929	995
Switzerland	450	439	413	558	617	691
Croatia	320	338	367	533	594	713
Norway	500	506	533	725	721	912
Other	377	405	434	445	450	140

Source: Global Trade Atlas. Assumes all 25 member countries throughout 2000-2005.

[a]Data reflect official EU-25 data after expansion on May 1, 2005. Prior to this date, the data are combined with the external trade data (trade with non-EU-15 members) of the 10 new member states.

exports. Major non-EU market destinations include Switzerland, Norway, and Russia. By volume, exports during the 2000-2004 period were mostly stable at about 1.5 million mt of oranges and about 500,000 mt of lemons annually. Exports were lower in 2005, mostly because of poor harvest conditions during that year.[26]

Spain's exports to the United States have also been hindered by concerns over the Mediterranean fruit fly (medfly) and tristeza. Currently, producers of fruit intended for sale in the United States are required to follow specific protocols which have been certified by the U.S. and Spanish governments.

Only a few farmers participate in this program.[27] The protocols require stricter cultivation practices, tracebility, and rules of origin documentation compared to citrus shipped to Europe.[28] Additionally, Spanish citrus exports to the United States were temporarily suspended in 2001when live Medfly larvae were found in Spanish clementines.[29] As a result, the United States developed a new protocol that extended cold treatments on citrus from Spain by one to two days depending on variety. This has raised concerns from Spanish farmers over both the shelf-life and quality of the fruit subjected to the protocol.[30]

Imports

Imports of fresh oranges and lemons account for a growing share of Spain's consumption, but still account for less than 15 percent of use (tables 11-4 and 11-5). Imports of both oranges and lemons more than doubled from 2000-2005 (tables 11-10 and 11-11), mostly to supplement Spain's supplies during the off-season. Most imports were supplied by Argentina and other Southern Hemisphere producers. EU tariffs on fresh oranges and lemons range from 3 percent to 85 percent, depending on product and season. Imports of citrus fruit into EU are required to meet the EU marketing standards, which include size, labeling, and packaging requirements.[31]

Competitive Factors

The primary competitive factors relevant to the Spanish citrus industry include accessibility of water, climate, favorable government policies and support programs, and proximity to key markets. Spain possesses a climate particularly suitable for citrus production, but periods of drought and excess rainfall pose a challenge to growers. Currently there is limited use of advanced irrigation systems, but recent reforms are stimulating the introduction of drip irrigation. Land for citrus production is expensive, and it is difficult to purchase as holdings are generally small and owned by families. Producers employ current technology and cultural practices to produce export-quality fruit. Concerns over tristeza and medfly have blocked access of Spanish citrus fruit to key import markets at various times during the past 5 years.

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[26] Expressed in U.S. dollar value, trade appears to be increasing over the period in part because of the appreciation of the euro relative to the U.S. dollar.

[27] Telephone interview with Spanish government officials, January 4, 2006.

[28] Email correspondence with Spanish government officials, February 2006.

[29] USDA, APHIS, "USDA Suspends Spanish Clementine Imports."

[30] Humpal, "Draft Report."

[31] EC Council Regulation No. 1799/2001.

Table 11-10 Fresh oranges: Spanish imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
			Quantity (metric tons)			
South Africa	34,108	40,589	38,102	49,990	59,914	54,568
Uruguay	10,806	24,671	16,026	26,273	23,687	24,521
EU-25 [b]	13,051	22,939	13,816	13,079	35,154	16,252
Argentina	4,269	37,528	16,494	22,597	19,244	16,244
Egypt	0	698	82	852	42	13,707
Other	16,918	58,737	15,900	41,645	29,265	48,945
Total	79,152	184,464	100,338	153,584	167,264	160,530
			Value (1,000 dollars)			
South Africa	8,548	18,769	15,330	25,374	42,800	32,681
Uruguay	4,480	12,537	7,172	13,917	16,212	14,639
EU-25	2,963	14,546	5,630	9,112	25,744	11,867
Argentina	1,782	19,533	6,367	11,884	13,860	9,438
Egypt	0	245	36	373	23	8,265
Other	4,649	20,020	5,119	13,164	10,217	23,571
Total	22,421	85,405	39,618	73,451	108,833	92,196
			Unit value (dollars per metric ton)			
South Africa	251	462	402	508	714	599
Uruguay	415	508	448	530	684	597
EU-25	227	634	407	697	732	730
Argentina	417	520	386	526	720	581
Egypt	([a])	351	439	438	548	603
Other	275	341	322	316	349	482

Source: Global Trade Atlas. Assumes all 25 member countries throughout 2000-2005.

[a]Data not available.
[b]Data reflect official EU-25 data after expansion on May 1, 2005. Prior to this date, the data are combined with the external trade data (trade with non-EU-15 members) of the 10 new member states.

Table 11-11 Fresh lemons/limes: Spanish imports by source, 2000-2005

Country	2000	2001	2002	2003	2004	2005
	Quantity (metric tons)					
Argentina	18,269	27,689	35,987	54,648	31,158	70,069
EU-25 [a]	3,963	6,936	2,436	5,160	2,831	8,471
South Africa	1,197	1,127	544	731	1,115	3,668
Uruguay	1,832	3,065	1,565	2,114	1,907	3,625
Brazil	90	21	203	495	58	193
Other	465	421	24	152	320	337
Total	25,816	39,259	40,759	63,300	37,389	86,363
	Value (1,000 dollars)					
Argentina	10,183	16,397	20,180	36,807	21,858	52,281
EU-25	2,259	4,219	1,585	3,126	2,386	7,413
South Africa	633	691	315	499	795	2,812
Uruguay	995	1,767	906	1,369	1,489	2,816
Brazil	51	24	207	428	61	185
Other	86	263	20	119	405	460
Total	14,206	23,361	23,213	42,348	26,993	65,967
	Unit value (dollars per metric ton)					
Argentina	557	592	561	674	702	746
EU-25	570	608	651	606	843	875
South Africa	529	613	579	683	713	767
Uruguay	543	577	579	648	781	777
Brazil	568	1127	1019	865	1047	958
Other	184	625	818	780	1265	1365

Source: Global Trade Atlas. Assumes all 25 member countries throughout 2000-2005.

[a]Data reflect official EU-25 data after expansion on May 1, 2005. Prior to this date, the data are combined with the external trade data (trade with non-EU-15 members) of the 10 new member states.

Natural Endowments

While Spain's Mediterranean climate is optimal for growing citrus,[32] variable rainfall and periods of drought can negatively affect production.[33] Soil quality in Spain can be very poor, characterized by low fertility and low nutrient levels. This can raise the cost of growing citrus as extensive micronutrient programs are required at most orchards.[34]

Water Issues

Spain's inconsistent supply of fresh water is the key factor limiting its competitiveness in the citrus market. Production has been significantly affected by at least one severe drought per decade (most recently the 2004/2005 growing season). Access to water throughout Spain is managed by a national government body and there has been a long-standing debate over how to properly manage water resources.[35] Most farms do not have their own wells and even if there is a well in an area, it is regulated by the Spanish government. While over 68 percent of Spain's water resources are used for irrigation, this encompasses only 15 percent of usable

[32] Horticulture Research International, "Spain - Climate."
[33] Igual and Izquierdo, "Economic and Financial Comparison."
[34] Gallasch Damiani, and Falivene, "Citrus Growing in Spain."
[35] "Whose Water, Exactly?" *The Economist*.

arable land in the country.[36] Citrus producing regions tend to have higher percentages of irrigated land. For example, in Valencia, 43 percent of land is irrigated (among the highest in Spain); in Murcia 34 percent is irrigated. Water costs tend to vary significantly, depending on whether the water originates from rivers, lakes, dams, or from subterranean sources.[37]

Compounding concerns over lack of water, a majority of small farms use flood irrigation which wastes water. Currently, under the EU's rural development program, citrus farms have been provided funding to switch to more efficient drip irrigation systems. The additional advantage is that the fertilizer system can be integrated with the irrigation system (fertigation), reducing overall costs for citrus farming.[38]

Pests and Diseases

Spain has significant problems with tristeza and medfly, which have reduced export opportunities to countries, such as the United States, which require strict controls. Valencia's Ministry of Agriculture (VMOA) estimates that each year in Valencia, the fly is responsible for about a 10,000-ton loss in citrus crop, equal to about $7 million.[39] Over 30 percent of trees are considered to have tristeza.[40]

The Spanish government has implemented numerous programs to help combat these pest and disease conditions. For example, to combat fruit fly, the VMOA is implementing a program in 2006 using sterile male medflies and traps for female flies. This program is expected to reduce infestations by up to 90 percent and substantially decrease annual crop losses and pesticide costs.[41]

Seasonality

Spain's citrus varieties enable its growing season to extend almost year-round. The harvesting season for oranges extends from September to June, depending on the variety. Lemons can be harvested year-round, but the primary season extends from October-April, shown in the following tabulation:

Oranges and lemons: Spanish marketing seasons by variety

Variety	Marketing season
Oranges:	
Navelina	mid-October - mid-January
Newhall	mid-October - mid-January
Washington navel	December - March
Navelate	mid-January - mid-April
Lane late	mid-January - mid-June
Lemons:	
Fino	September-May
Verna	May-September

Source: Intercitrus; correspondence with Spanish lemon industry trade association, June 22, 2006.

[36] MAPA, "Hechos y Cifras," 16.
[37] Genoves, Reus, and Molla, "Precios, Costos, y Uso del Aqua," 17.
[38] Telephone interview with Spanish government officials, January 2006.
[39] USDA, FAS, *GAIN Report*, No. SP5029.
[40] Witney and Chao, "The Clemintine Mandarin Industries."
[41] USDA, FAS, *GAIN Report*, No. SP5029.

Labor

One of the main features of Spain's citrus labor market is the predominance of part-time employment.[42] Employment data for the sector can be misleading, because the statistics are collected based on a worker's main economic activity. Although the use of full-time labor is growing, the majority (75 percent) of farms, largely use owner-operator and other family labor.

Average labor costs for citrus in Spain in 2005 were between $48 per day for the lowest paid citrus worker (those that plant and tend trees) and $57 per day for the highest paid (technical specialists for diseases).[43] To lower costs, Spanish citrus growers often employ migrant labor from Morocco, Turkey, Poland, and Romania.[44]

Land

Nearly all Spanish farms are individually-owned.[45] There has been limited corporate investment in the larger farms in the Andalucia region. However, under the auspices of the EU's rural development program, there has been a push to maintain individual land ownership in Spain, particularly agricultural land. Of all cultivated land, citrus has one of the highest land values. In 2004, the average price of land in Spain was about $10,000 per hectare; however, citrus land was valued at about $72,000 per hectare.[46]

Production Technology

Citrus cultivation in Spain, particularly for oranges and mandarins, mostly relies on traditional cultural practices. Most cultivation activities are performed by hand. Trees are planted close together and cut small (2-3 meters) to ease pruning and harvesting. In 2002, about 60 percent of orange trees were on orchards with densities set between 375-624 trees per hectare range. Densities for lemons were considerably lower, with about 70 percent of orchards in the 250-499 trees per hectare.[47] Trees are pruned to increase fruit size. Pruning accounts for about 20 percent of all cultural costs for citrus production.[48] Additionally, Spanish citrus farmers undertake considerable crop monitoring and forecasting.[49]

The use of the latest technology, including plant grafting, varietal and density shifts, export-conforming cultural practices, and high-speed sorting and packing, is one of Spain's leading competitive strengths. However, due to the traditional cultural practices and small size of the citrus plots, mechanization in the orchard is not a significant component of the Spanish citrus industry. For example, on some farms in Valencia, the high tree densities prohibit conventional tractors from getting between the trees. Farm machinery is typically rented or pooled through local cooperatives.[50] This method of sharing farm machinery can provide an advantage to farmers by enabling them greater access to technologies through the cooperative than they could on their own.

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[42] MAPA, "Hechos y Cifras."
[43] MAPA, "Publicación de Precios Percibidos, Pagados y Salarios," 17.
[44] Telephone interview with U.S. government official, January 2006.
[45] MAPA, "Hechos y Cifras." The 1999 Census reported 96 percent of farms were individually-owned.
[46] MAPA, "Hechos y Cifras," 3.
[47] MAPA, "Encuesta sobre Plantaciones de Arboles Frutales."
[48] Whitney and Chao, "The Clemintine Mandarin Industries."
[49] Gallasch, Damiani, and Falivene, "Citrus Growing in Spain."
[50] Igual and Izquierdo, "Economic and Financial Comparison."

Another of Spain's key strengths is its proximity to its major markets. Its packing and sorting operations maximize this advantage. The need for cold storage is limited as the majority of fruit is consumed soon after harvest in nearby European countries. Most Spanish orange farmers are financially able and willing to invest in new fruit production technologies, as most are part-time farmers and do not depend on citrus as their main source of income.[51] Access to farm credit and capital is usually through the cooperative or producer organization.[52]

Government Policies and Support

Spain's citrus industry has traditionally been supported by the EU's long standing production programs and related agriculture policies, and many producers outside the European Union consider these policies to provide a competitive advantage to Spain's citrus growers. The main mechanism of government assistance to citrus growers is through the Common Market Organization (CMO) for all fruits and vegetables as part of the EU's Common Agriculture Policy (CAP).[53] For citrus, the primary support mechanisms include compensation for withdrawals,[54] compensation to encourage fruit processing, co-financing of operational funds for producer organizations, export refunds, and other types of support. Most of the direct support to citrus farmers is dispensed through the Producer Organizations (POs) operational funds for the purpose of improving product quality and marketing, reducing production costs and developing sustainable production methods.[55]

Information is not reported on the amount of EU funding provided to Spain specific to citrus fruit. Annual expenditures supporting all EU citrus production averaged about €1.2 billion (roughly $1.0 billion) per year (1995-2001), accounting for about 2 percent of annual EU agricultural spending.[56] In 2001, annual support levels for fresh oranges and lemons totaled about €380 million (about $350 million) and €280 million (about $250 million),

[51] USDA, FAS, *GAIN Report* No. SP4026.

[52] Telephone interview with U.S. government official, January 2006.

[53] A CMO is a group of products subject to common regimes regarding domestic support, trade, and other policies. Basic rules for the CMO for fresh fruit and vegetables are outlined in Council Regulation N° 2200/96. For more detailed information of regulations governing EU's programs for fruit and vegetable, see: Council Regulation (EC) N° 2200/96 and Council Regulation (EC) N° 2201/96 (October 1996) and its December 2000 amendments, Council Regulation (EC) N° 2699/2000, Council Regulation (EC) N° 2201/96, and Council Regulation (EC) N° 2202/96. Funding is through the EU's European Agricultural Guarantee and Guidance Fund, which finances the EU's CAP and is one of the EU's four Structural Funds, which co-finances policies and programs that assist structural change in the agricultural sector and to promote rural development.

[54] Withdrawal funds are paid to POs to remove product from the market place in an effort to stabilize prices.

[55] EU fruit growers are encouraged to join POs, which receive money from the EU and their grower members. POs set quality and volume controls, and set prices and promote consumption through marketing. Spain's citrus sector POs include organizations such as Spain's Intercitrus and Ailimpo.

[56] WTO, "Product-Specific AMS; WTO, "Notification." The EU funding data are estimates for all EU countries based on EU-reported product-specific "Aggregate Measures of Support" (AMS) provided to the WTO. Latest reporting year available. Includes support for EU citrus growers for oranges, lemons, Clementines, mandarins, and satsumas. Average annual notified expenditures for processing aid and other commodity specific support. In 2001, the EU's agriculture budget totaled €44.5 billion (about $40 billion). See: Commission of the European Communities, *32nd Financial Statement*.

respectively.[57] These estimates do not include support for citrus fruit for processing, aid to producer organizations, and other types of support. Spain is among the EU's top recipient of support for its citrus sectors, along with Portugal, Italy, and Greece. In 2003, Spain accounted for 30 percent of the EU's budgetary expenditures supporting all fruit and vegetables.[58] Payments to encourage the use of citrus for processing and juice account for roughly 20 percent of total support, ranging from about €110 million to €210 million per year for oranges and other citrus and about €30 million to €40 million per year for lemons (1995-2001).[59] Withdrawal funds[60] for citrus were between €130/mt to €140/mt each for oranges, lemons, and mandarins in 2001.[61]

In 2004, EU appropriations for aid to Spain's producer organizations and other related support[62] totaled €121 million (about $146 million) for all fresh fruits and vegetables.[63] Information is generally not available on the amount of support paid to individual POs or by sector. EU citrus fruit is also eligible for export refunds, but information is not available by commodity and country.[64] Other forms of support include ongoing marketing and promotional activities, which are co-financed by the EU, central and regional governments, and private industry. Co-financing of promotion and marketing campaigns accounts for between 40-100 percent of the cost of these programs.[65]

In addition, the EU's expanded focus on rural development and sustainable management, as part of broader CAP reforms, has further expanded benefits to citrus farmers.[66] EU allocations for rural development during 2000-2006 were reported at €49.1 million (about $59 million), with Spain expected to get about 9 percent of the allocated funds.[67] Under these programs, Spain's citrus farmers are eligible for funds to modernize farming practices,

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[57] WTO Committee on Agriculture, "Product-Specific AMS." Latest reporting year available. Converted to US dollars (2001) by Commission staff. Support for citrus fruit processing totaled €213 million for all citrus and €52 million for lemons.

[58] USDA, FAS, *GAIN Report* No. E35053, 4. In 2003, Spain received €471 million of the EU's expenditures for fruit and vegetables (€1.5 billion). Includes outlays to Spain's other agriculture sectors, including its heavily-supported olive sector.

[59] USDA, ERS, "Global Trade Patterns in Fruits and Vegetables," USDA ,FAS, *GAIN Report* No. 35053. In 2005, appropriations for all citrus processing totaled €261 million. Current processing subsidies for oranges and lemons are between €80/mt-€100/mt, depending on the type of contract (annual, multi-year, or individual producers). See: USDA, FAS, *GAIN Report* No. SP5040.

[60] Withdrawal funds are paid to POs to remove product from the market place in an effort to stabilize prices.

[61] USDA, ERS, "Global Trade Patterns in Fruits and Vegetables," 33; USDA FAS, *GAIN Report* No. E20070, 6. Data for 2000/01, reported between €130/mt €140/mt and converted by Commission staff.

[62] Support includes economic aid to grower organizations including those that set quality and volume controls and set prices and increase consumption through marketing; subsidies to growers for products grade citrus used for processing and juice; subsidies to agricultural cooperatives, associations and societies to meet administrative and office operational costs, including personnel.

[63] FEGA, "Hortofruticola," 28. Includes PO funding for other fruit and vegetable production in Spain. Total PO funding for all EU countries totaled €405 million in 2004. See: USDA, FAS, *GAIN Report* No. E35053.

[64] USDA, ERS, "Global Trade Patterns in Fruit and Vegetables, 34." Export refunds are intended to cover the difference between the world price for citrus and the EU price. The EU is allowed to spend up to $48 million annually on fruits and vegetables according to WTO limitations. 2005 EU appropriations for horticulture export refunds totaled €41 million. Fruits eligible for export subsidies include apples, lemons, oranges, peaches, nectarines, and table grapes.

[65] UNCTAD, "Economic Policies;" USDA, FAS, *GAIN Report* No. E20070, 14.

[66] For more detailed information of regulations governing EU's rural development programs, see: Council Regulation (EC) N° 1257/1999 (May 1999), Council Regulation N° 2603/1999 (December 1999), Council Regulation N° 567/2003 (March 2003) and related documents pertaining to funding levels.

[67] USDA, FAS, *GAIN Report* No. E34095, 4-5.

particularly to transition from flood to drip irrigation in order to conserve water.[68] Other types of development support reportedly include: (1) support for capital and facility improvements, providing up to 20 percent of the cost of modernization of operations; (2) support for integrated phytosanitary treatments, including new technology and equipment to meet operational needs, providing up to 40 percent of total project costs; (3) grower payments for new or re-plantings of citrus for globally competitive varieties; (4) support payments for young (age 18-40 years) growers of about €50,000 per grower; and (5) assistance to Spanish lemon and grapefruit growers, reported at about €48/mt).[69]

EU citrus growers also have access to advanced research and agriculture extension services. In Spain, most citrus research and extension is carried out at the Instituto Valenciano de Investigaciones Agrarias (IVIA), funded by the Valencia Regional Government.

Regulatory Compliance

There are extensive regulatory compliance requirements within the Spanish citrus industry. The most important is the EU's marketing standards for fruits and vegetables.[70] These standards include mandates on requirements for preparation and packaging as well as standards for maturity, size, and shape.

A significant regulatory issue affecting Spanish citrus growers is compliance with EurepGAP, a set of quality standards that certain producers have committed to follow.[71] While this is a voluntary scheme, many producers in Spain, including all those under Anecoop, are certified under this program. Producers are qualified by an approved certification body and grow fruit under an approved label. For example, Anecoop's "Naturane" label is an approved EurepGAP scheme. The adoption of EurepGAP requires internal and external audits, implementation of quality and traceability systems, record keeping of field operations, analysis and certification, and technical assistance. Such additional costs can be slightly offset by management of these factors through a cooperative.[72] Exports to the United States must also adhere to certain protocols for growing and shipping in order to clear U.S. customs, and certification of the growers fields in Spain by USDA APHIS is required.[73]

Costs of Production

Available farm-level cost and returns information for citrus production in Spain are from a series of surveys and studies conducted by researchers at the Polytechnic University of Valencia.[74] Production costs for oranges are based on surveys conducted in 2000, 2003, and 2004. Production costs for lemons are based on a more recent unpublished survey results

[68] Correspondence with U.S. Embassy official, November 2005 through February 2006.

[69] Wooton, Statement of the Sunkist Growers submitted to USTR; USDA, FAS, *GAIN Report* No. E34095, 4; Europa "Rural Development: Legal base."

[70] EC Council Regulation No. 2010/2002.

[71] The EurepGAP (Euro Retailer Group for Good Agricultural Practices) refers to standards established by European retailers to offer high quality food products grown and certified under protocol and complying with specific standards. Standards may vary according to requirements within each production area. For more information see: EurepGAP, *http://www.eurepgap.org/fruit/Languages/English/index_html*.

[72] Moll and Igual, "EurepGAP Protocol versus Standard Production."

[73] Email correspondence with Spanish government officials, January 2006.

[74] Moll and Igual,"EurepGAP Protocol versus Standard Production;" Igual and Izquierdo," Economic and Financial Comparison;" Caballero, "Dificultad en los Cambios," 37-49. Costs calculated using survey data and a cost accounting system.

from 2005. These data report average production costs for orchards growing navel oranges and lemons in the Valencia region on farms with typically less than one hectare plots. Cost data are from surveyed farmers, technicians and cooperative managers, and extension specialists. In some cases, these studies report average costs and returns data for different types of production systems, comparing costs for conventional production systems to costs to produce crops grown under EurepGAP protocol regulations and also organic citrus. Reported farm-level costs are expressed in terms of variable, fixed, and total costs to grow oranges and lemons (tables 11-12 and 11-13). The Commission obtained only incomplete cost information for citrus packing facilities in Spain.

Total Costs

The cost to produce oranges in Spain is estimated to be between $2,700-$4,400 per hectare, depending on the type of production system used (table 11-12). These costs translate to per-unit costs of between $117/mt and $147/mt output for oranges. Orange costs reflect conditions during 2003.[75] The cost to produce lemons is higher at about $5,800 per hectare, or about $165/mt (table 11-13). Lemons costs reflect conditions during 2004. These reported costs specifically exclude the opportunity costs of the owner-operator and, in some cases, exclude depreciation. Opportunity costs of the owner-operator are estimated at about $1,300 per hectare, which include land rent and interest costs.[76]

Available information on packing costs is based on recent survey information on harvesting and warehouse transport costs and other wholesale costs for lemons. Estimated harvesting and warehouse transport costs for lemons were about $96/mt in 2004 (table 11-13).[77] Other recent cost information report lemon harvest costs at about $118/mt, plus other warehouse and packing costs of $224/mt.[78] Reported FOB costs for lemon exports total about $590/mt.[79]

For oranges, costs vary according to the different type of production system, including conventional crop systems and EurepGAP-compliant or integrated production systems. Costs incurred under conventional systems are reported to be higher than those for integrated production. The latter often have lower costs for fertilizers, pesticides, herbicides and other nutrients, mainly because the cooperative technicians can adjust the input doses as close to minimum values as possible to comply with the standards.[80] Also, costs are often integrated at the cooperation-level and shared across farms. Reported orange costs for conventional systems are about $4,400 per hectare, whereas costs for integrated production systems are about $2,800 per hectare (table 11-12). Costs presented here do not show reported available cost data for a certified organic citrus operation.[81]

[75] Other cost data for 2000 from a larger-scale survey of producers in Valencia, shown in table 11-12, generally corroborate these 2003 costs, which are based on smaller test plots.

[76] Caballero, “Dificultad en los Cambios,” 37-49.

[77] Caballero, “Dificultad en los Cambois,” 37-49. Converted to U.S. dollars.

[78] Email correspondence with Spanish lemon trade association, June 22, 2006. Other warehouse and packing costs reflect reported costs for "manipulado almacén" and "materiales auxiliaries." Converted to U.S. dollars.

[79] Ibid. Farm costs for lemons reflected in these estimates are reported at about $129/mt.

[80] Igual and Izquierdo, “Economic and Financial Comparisons;” Moll and Igual, “EurepGAP Protocol versus Standard Production.”

[81] Surveyed costs for organic citrus farms are not presented here and tend to be higher than costs for other citrus production. Higher costs are mostly attributable to fertility management given the often high cost and scarcity of mostly high-value manures and the associated labor costs with hand-spreading. Yields are also lower at organic operations, which are offset by price premiums received for organic produce above that received for conventional produce.

Table 11-12 Oranges: Spanish average costs of production and cost shares

Cost component	EurepGAP-compliant or integrated production (2003) Value (dollars/ha)	Cost share (percent)	Conventional (2003) Value (dollars/ha)	Cost share (percent)	Conventional (2000) Value (dollars/ha)	Cost share (percent)
Variable costs:						
Irrigation water	292	11	770	17	882	20
Fertilizers	359	13	505	11	413	9
Pesticides, herbicides, fung.	248	9	522	12	747	17
Other inputs	-	-	70	2	44	1
Equipment operating cost	105	4	68	2	-	-
Labor cost	825	31	1,368	31	953	22
Total, variable costs	1,829	68	3,303	75	3,039	69
Interest on working capital	-	-	-	-	93	2
Fixed costs:						
Equipment ownership costs	378	14	303	7	331	8
Crop depreciation	405	15	399	9		
Holding maintenance	0	-	65	1	[a]637	14
Taxes and insurances	70	3	335	8	221	5
Total, fixed costs	854	32	1,103	25	1,281	29
Total costs	2,683	100	4,405	100	4,408	100
Average costs (dollars/mt)	117	-	147	-	147	-

Source: Data for 2003 are from Moll and Igual, "EurepGAP Protocol Versus Standard Production." Table 2. Data are provided for by "La Constancia" Coop technicians based on 9 plots managed under cooperative, cultivating navel oranges using flow irrigation on land-holdings of under 2 hectares in Valencia 2003. Total costs specifically exclude opportunity costs. Converted to US dollars by Commission staff assuming a real exchange rate (2000 prices) for 2003 ($1 = € 0.89). Per-unit costs assume reported average yields of 23 mt/ha (EurepGAP) and 30 mt/ha (conventional).

Data for 2000 data are from Igual and Izquierdo, "Economic and Financial Comparison." Costs are from a survey of 1,225 conventional producers in Valencia. Converted to U.S. dollars by Commission staff assuming a real exchange rate (2000 prices), $1 = €1.09.

[a]Combined costs for cost of replacing trees and maintaining equipment, amortization and interest from planting, interest on capital on equipment, and income from land.

Table 11-13 Lemons: Spanish average costs of production and cost shares

Cost component	Value (US dollars/ha)	Share of total (percent)
Variable costs:		
Water	1,014	18
Fertilizers	581	10
Insecticides, fungicides, herbicides, etc	833	14
Other raw materials	75	1
Labor	1,606	28
Machinery rental	221	4
Total, variable costs	4,330	75
Fixed costs:		
Equipment ownership costs	348	6
Crop depreciation (36 years)	309	5
Drip irrigation depreciation	371	6
Other costs	80	1
Taxes and insurance	322	6
Total, fixed costs	1,429	25
Total costs	5,759	100
Average costs (dollar/mt)	165	
Opportunity costs:		
Land rental	869	
Interest on working capital[a]	87	
Interest payments on crop	223	
Interest payments on drip irrigation	107	
Total, opportunity cost	1,285	
Harvesting and transportation to warehouse	3,373	
Average cost (dollar/mt)	96	

Source: Caballero, "Dificultad en los Cambios," 37-49. Reported data are preliminary and may be subject to change. Based on surveyed data from lemon farmers (variety: Fino, *C.Macrophylla*) using drip irrigation on land-holdings of under 2 hectares in Valencia (Murcia) in 2005. Converted to USD by Commission staff assuming real exchange (2000 prices) for 2004 ($1 = € 0.83). Per-unit costs assume reported average yields of 35 mt/ha. Picking/harvesting and transportation costs are reported assuming a unit cost of 0.08 €/kg.

[a]Interest on working capital estimated assuming 4 percent annually over 6 month average period.

Major Cost Components

Farm-level costs are expressed in terms of variable, fixed, and total grower costs. Variable costs account for roughly 70 percent of total costs, with the remainder accounting for fixed costs.[82] Labor is the major cost component to grow oranges and lemons in Spain, although labor costs as a share of costs are highly variable among the available surveyed cost information (tables 11-12 and 11-13). For oranges, labor costs account for about 30 percent of total farm-level costs. For lemons, available information indicates that labor costs account for 20 percent of total costs. Chemical costs, including all fertilizers, pesticides and other chemical inputs, account for a combined share of 20-35 percent of orange costs, depending on the type of production system used. Irrigation water accounts for another 5-20 percent of reported orange costs, depending on the type of production and irrigation system used

[82] Includes sunk costs such as costs of planting trees, purchasing and maintaining equipment, interest payments, and taxes and fees, but excludes depreciation costs in the case of available reported survey information for Spain.

(table 11-12). For lemons, chemicals account for 20 percent of costs and water accounts for 14 percent (table 11-13).

Available cost data for oranges do not appear to include land costs. Land rental costs are provided in the cost data for lemons, estimated at about $870 per hectare, but are itemized along with other reported farm opportunity costs. Costs for oranges do not include land rental. Available information on orchard development costs over the period spanning tree planting to maturity shows annual costs of under $2,000 per hectare for the first two years, with labor costs accounting for about one-half of development costs.[83] Development costs rise to more than $3,000 per hectare annually by the fourth year, consisting of mostly irrigation water, fertilizers, pesticides, and costs for other chemical inputs (about 60 percent of orchard costs), along with labor costs (about 30 percent). Machinery and equipment costs in Spain account for roughly 10 percent of total citrus production costs.

[83] Igual and Izquierdo, “Economic and Financial Comparisons,” 23.

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APPENDIX A
REQUEST LETTER FROM COMMITTEE ON WAYS AND MEANS

WILLIAM M. THOMAS
22ND DISTRICT, CALIFORNIA

CHAIRMAN
COMMITTEE ON WAYS AND MEANS
CHAIRMAN
JOINT COMMITTEE ON TAXATION

2208 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-0522
(202) 225-2915

Congress of the United States
House of Representatives
Washington, DC

DISTRICT OFFICES
4100 EMPIRE DRIVE, SU
BAKERSFIELD, CA 93
(661) 327-3611

5805 CAPISTRANO AVENU
ATASCADERO, CA 93
(805) 461-1034—NORTH
(805) 549-0390—SOUTH

INTERNET:
www.billthomas.hou

June 30, 2005

DOCKET NUMBER
2436
Office of the Secretary
Int'l Trade Commission

2005 JUL -5 AM 10: 16
US INTL TRADE COMM

Mr. Stephen Koplan
Chairman
U.S. International Trade Commission
500 E Street, SW
Washington, DC 20436

Dear Mr. Chairman:

It has come to the attention of the Committee on Ways and Means that certain U.S. citrus growers are concerned about the competitive conditions affecting certain sectors of their industry. In order to assess more fully the nature and extent of these conditions, this Committee needs information concerning the competitive conditions in certain U.S. citrus industry sectors.

Thus, I am writing to request that the U.S. International Trade Commission (ITC) conduct an investigation under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) on conditions of competition affecting U.S. production and trade in the fresh market for oranges and lemons during the period 2000-2004. To the extent possible, the investigation should focus on navel oranges and lemons produced for the fresh market, with information provided on broader segments as appropriate. This information will be useful to Congress as it engages in oversight and legislative activities. The report should include, to the extent possible, the following:

- an overview of the global market for oranges and lemons for the fresh market, including production, consumption, and trade;

- profiles of the orange and lemon fresh-market industries in the United States and principal foreign producer countries, such as Australia, Argentina, Chile, China, Mexico, Spain, and South Africa;

- an analysis of U.S. trade in fresh-market oranges and lemons with major competitor countries, including a description of trade practices and measures; and,

- a comparison of the strengths and weaknesses of the U.S. fresh-market orange and lemon industries with foreign competitors, in such areas as input costs of production (such as, labor, land value, water, energy, packing costs, transportation to market, fertilizer and pesticides, taxes, and regulatory compliance), technology, government programs, exchange rates, and pricing and marketing regimes.

Finally, the Commission should provide its completed report no later than 12 months from the receipt of this request. Thank you for your consideration in this matter.

Best regards,

Bill Thomas

WILLIAM M. THOMAS
Member of Congress

WMT/mdh

APPENDIX B
FEDERAL REGISTER NOTICE

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–469]

Conditions of Competition for Certain Oranges and Lemons in the U.S. Fresh Market

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of public hearing.

EFFECTIVE DATE: July 28, 2005.

SUMMARY: Following receipt of the request on July 5, 2005, from the House Committee on Ways and Means, the Commission instituted investigation No. 332–469 *Conditions of Competition for Certain Oranges and Lemons in the U.S. Fresh Market,* under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)).

Background: As requested by the Committee, the Commission will conduct an investigation and provide a report on competitive conditions for certain oranges and lemons in the U.S. fresh market during the period 2000–2004. To the extent possible, the investigation will focus on navel oranges and lemons produced for the fresh market, with information provided on broader segments as appropriate. In its report the Commission will provide, to the extent possible, the following:

- An overview of the global market for oranges and lemons for the fresh market, including production, consumption, and trade;
- Profiles of the orange and lemon fresh-market industries in the United States and principal foreign producer countries, such as Australia, Argentina, Chile, China, Mexico, Spain, and South Africa;
- An analysis of U.S. trade in fresh market oranges and lemons with major competitor countries, including a description of trade practices and measures; and,
- A comparison of the strengths and weaknesses of the U.S. fresh-market orange and lemon industries with foreign competitors, in such areas as input costs of production (such as labor, land value, water, energy, packing costs, transportation to market, fertilizer and pesticides, taxes, and regulatory compliance), technology, government programs, exchange rates, and pricing and marketing regimes.

As requested, the Commission will transmit its report to the Committee by July 5, 2006.

FOR FURTHER INFORMATION CONTACT: Industry-specific information may be obtained from Joanna Bonarriva, Project Leader (202–205–3312 or *joanna.bonarriva@usitc.gov*) or Renee Johnson, Deputy Project Leader (202–205–3313 or *renee.johnson@usitc.gov*), or George Serletis, Deputy Project Leader (202–205–3315 or *george.serletis@usitc.gov*), Office of Industries, U.S. International Trade Commission, Washington, DC 20436. For information on legal aspects of this investigation, contact William Gearhart of the Office of General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). Hearing impaired individuals are advised that information on this matter can be obtained by contacting the TDD terminal on (202–205–1810). General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*). The public record for these investigations may be viewed on the Commission's electronic docket (EDIS–ONLINE) at *http://edis.usitc.gov/hvwebex.*

Public Hearing: A public hearing in connection with the investigation will be held at the U.S. International Trade Commission Building, 500 E Street SW., Washington, DC beginning at 9:30 a.m. on February 7, 2006. All persons shall have the right to appear, by counsel or in person, to present information and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 500 E Street SW., Washington, DC 20436, no later than 5:15 p.m., January 24, 2006. Any prehearing briefs (original and 14 copies) should be filed not later than 5:15 p.m., January 26, 2006. The deadline for filing post-hearing briefs or statements is 5:15 p.m., February 21, 2006. In the event that, as of the close of business on January 24, 2006, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant may call the Secretary (202–205–2000) after January 24, 2006, to determine whether the hearing will be held.

Written Submissions: In lieu of or in addition to participating in the hearing, interested persons are invited to submit written statements concerning the investigation. All submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW., Washington, DC 20436, and should be received no later than the close of business on February 21, 2005. All written submissions must conform with the provisions of section 201.8 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.8). Section 201.8 of the rules requires that a signed original (or a copy designated as an original) and fourteen (14) copies of each document be filed. In the event that confidential treatment of the document is requested, as least four (4) additional copies must be filed, in which the confidential information must be deleted (see the following paragraph for further information regarding confidential business information). The Commission's rules do not authorize filing submissions with the Secretary by facsimile or electronic means, except to the extent permitted by section 201.8 of the rules (see Handbook for Electronic Filing Procedures, *ftp://ftp.usitc.gov/pub/reports/electronic_filing_handbook.pdf*).

Any submissions that contain confidential business information must also conform with the requirements of section 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the "confidential" or "non-confidential" version, and that the confidential business information be clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available in the Office of the Secretary to the Commission for inspection by interested parties. The Committee has asked that the report that the Commission transmit not contain any confidential business information. Any confidential business information received by the Commission in this investigation and used in preparing the report will not be published in a manner that would reveal the operations of the firm supplying the information.

Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Secretary at 202–205–2000.

By order of the Commission.

Issued: August 2, 2005.

Marilyn R. Abbott,

Secretary to the Commission.

[FR Doc. 05–15572 Filed 8–5–05; 8:45 am]

BILLING CODE 7020–02–P

APPENDIX C
SYMMETRIC REVEALED COMPARATIVE ADVANTAGE

It is difficult to quantify international differences in comparative advantage for the following reasons: trade flows are often influenced by government interventions and not comparative advantage, problems with data aggregation, and the fact that comparative advantage is defined in terms of relative product prices in the absence of trade, which are not observable. In 1965, Balassa proposed an index of revealed comparative advantage using observed export statistics to reveal the underlying pattern of comparative advantage.[1] For example, orange RCAs are a function of each country's exports of oranges divided by it total exports of fruits and vegetables divided by world exports of oranges divided by world exports of fruits and vegetables, as shown by the following equation:
where *i* is a commodity index and *r* is a country index,

$$RCA_{ir} = \frac{X_{ir} / X_r}{X_i / X}$$

X_{ir} is exports of oranges from country *r*,
X_r is total exports of fruits and vegetables from country *r*,
X_i is global trade in oranges, and
X is total global trade in fruits and vegetables.

The symmetric RCA (SRCA) index, which is symmetric around zero, translates a country's RCA into a number between -1 and +1, with a high positive value indicating a high degree of revealed comparative advantage, and a high negative value indicating comparative disadvantage.[2] Since RCA values can vary from zero to infinity, where a value between zero and one indicates comparative disadvantage and a value between one and infinity indicates comparative advantage, the SRCA represents a more tractable version of the RCA index.[3] Conversion from RCA to SRCA is shown by the following equation:

$$SRCA_{ir} = \frac{RCA_{ir} - 1}{RCA_{ir} + 1}$$

[1] Balassa, "Trade Liberalization and 'Revealed' Comparative Advantage."
[2] Kilaursen and Engedal, "The Role of the Technology Factor in Economic Growth: A Theoretical and Empricial Inquiry into new Approaches to Economic Growth." In 1995, Laursen and Engedal developed the symmetric RCA (SRCA) index, which ranges between -1 and +1 and is symmetric around zero.
[3] For a more detailed discussion of comparative advantage, RCA, and SRCA, see: USITC, *Export Opportunities and Barriers in African Growth and Opportunity Act-Eligible Countries*; USITC, *The Economic Impact of Establishing a Free Trade Agreement (FTA) Between the United States and the Republic of Korea*; Altay and Gacaner, "Turkey's Dynamics of Competition;" Akgungor, Barbaros, and Kumral, "Competitiveness of the Turkish Fruit and Vegetable Processing Industry;" and Wahl, "China as a Market and Competitor."