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Prospects for India's Emerging Apple Market

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and Barry Krissoff

Abstract

Strong economic growth is projected to lead to continued expansion of Indian apple demand, but the high cost of domestic and imported apples compared with other Indian fruit is likely to limit consumption to higher-income consumers. U.S. apples have accounted for the largest share of Indian imports, but face increasing competition from high-quality and low-cost Chinese apples. Although India has a high (50-percent) tariff on imported apples, internal marketing margins—or returns to traders over and above measured costs—account for a significantly larger share of consumer apple prices than do import prices, tariffs, or marketing costs. As a result, increased investment and competition in the domestic supply chain is likely to be particularly effective in boosting apple demand and imports. Domestic growers appear not to have been damaged by the entry of relatively high-priced and high-quality imports, nor have they exploited the opportunity to boost earnings by improving quality to compete with imported apples.

Keywords: India, apples, production, consumption, imports, tariff, marketing costs, marketing margins, projections.

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Table of Contents

Introduction	2
Demand for Apples in India . . .	3
Apple Production	8
Apple Trade	14
Apple Marketing	23
Apple Import Projections	33
Conclusions	35
References	37

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Introduction

In the 1990's, the Indian economy entered a state of transition when the reform of highly protectionist domestic and trade policies led to more rapid growth in incomes and foreign trade. Trade reforms gathered momentum after the Uruguay Round and the first major liberalization of agricultural trade occurred in 1997, when quantitative import restrictions were lifted and private trading was permitted in several food items. By 1999, quantitative import restrictions had been removed on about 470 agricultural products, and, in April 2001, the Government removed the restrictions on almost all agricultural products. Although many bound tariff rates remain high, applied tariffs are now low enough to permit rising imports of a number of farm commodities. Among these are pulses and vegetable oils—of which India is the world's largest importer—as well as smaller amounts of horticultural and processed products, including apples.

With the lowering of trade barriers, agricultural exporters now have a growing interest in the potential of India's large, and increasingly dynamic, market. This study analyzes recent developments in India's market for apples, a commodity that India both produces and—beginning in 1999—imports from the United States and other suppliers. The findings highlight the importance of “behind the border” factors—factors beyond the traditional focus on tariffs and other border measures—in expanding exports to emerging markets. Although India's apple tariff is one of the highest in the world, internal marketing margins—or returns to traders over and above measured costs—play an even larger role in raising domestic prices and restricting apple consumption. Factors contributing to high trading costs and margins include lack of competition in the marketing system, lack of investment and integration in the marketing chain, and the marketing and price risks faced by growers.

The Indian apple market also provides an example of the potential implications of import liberalization for domestic producers in emerging markets. Import liberalization for agricultural products, such as apples, has been a cause for concern among Indian farm policymakers who are primarily focused on the welfare of domestic producers. An important finding of this study is that Indian apple producers appear not to have been adversely affected by imports because the relatively high quality and price of imported apples make them imperfect substitutes for domestic apples. Instead, the presence of imported apples demonstrates an opportunity for domestic growers to increase earnings by improving quality to compete with imported apples.

Demand for Apples in India

Although production and consumption are small in per capita terms, India is the sixth largest producer and consumer of apples in the world. Growth in both production and consumption has been sluggish despite rising incomes. Apple demand is responsive to changes in both income and price, and demand for domestic and, particularly, imported apples is likely slowed by their high price relative to other fruits.

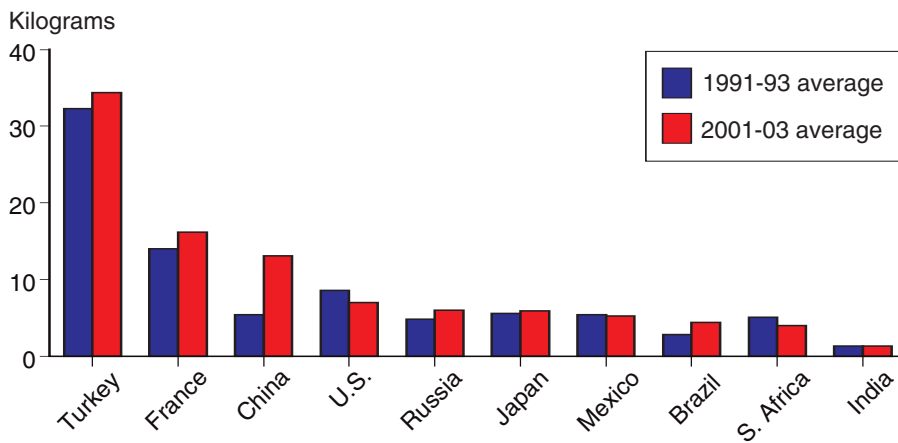
Consumption Growth Slow Despite Rising Incomes

India's per capita apple consumption of about 1.35 kgs per year is low relative to other major producing countries (fig. 1). Because apples are a relatively high-priced fruit in India, consumption is largely confined to the higher-income segments of the population. More than 60 percent of India's total income is shared by only 40 percent of the population (Gupta, 2001). But, even if we assume that apple consumption is confined to the top 40 percent of the population by income, per capita apple consumption of about 3.5 kgs in that segment of the population is still low in comparison with other major producing countries.

India's apple consumption has shown little growth in recent years. Consumption growth has been negligible since the late 1980s, a period that corresponded with rapid gains in income (fig. 2). Growth in apple consumption in India has also been slow relative to that of most other major producing countries (table 1).

Gains in per capita apple consumption remain sluggish despite high rates of economic growth that are creating conditions for strengthening demand for apples and other non-staple and higher-valued foods. Since the late 1980s, India has had one of the world's fastest growing economies, with recent real Gross Domestic Product expanding at 6-7 percent annually (fig. 3). Faster income growth has contributed to a declining poverty rate and the

Figure 1
Selected countries: Per capita apple consumption

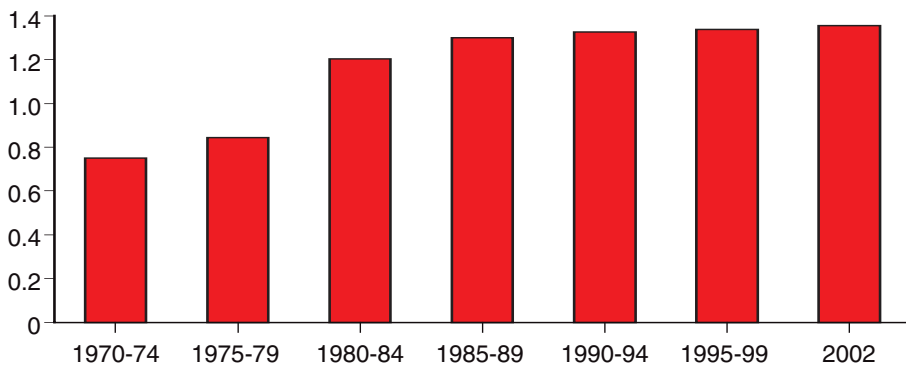


Source: FAOSTAT.

Figure 2

Per capita apple consumption in India

Kilograms



Source: FAOSTAT.

Table 1—Growth in apple food use by major world producers

Country	Food use (2000-02 average)	Compound annual growth rate	
		1990-2001 ¹	1995-2001 ²
	1,000 metric tons	Percent	
China	14,064	12.7	3.2
United States	5,603	0.2	-0.5
Turkey	1,994	2.1	1.9
Japan	1,815	6.1	3.7
Italy	1,224	-0.3	0.3
India	1,103	1.0	-0.3
France	694	3.6	3.6
Australia	336	1.6	4.0
South Africa	159	-0.7	-1.5
New Zealand	120	2.1	1.9

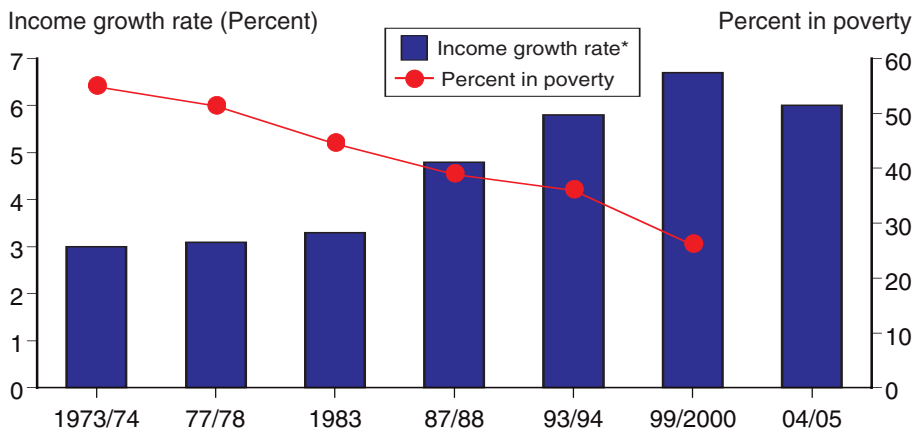
¹Growth rate between 1989-91 average and 2000-02 average.

²Growth rate between 1994-96 average and 2000-02 average.

Source: Compiled by ERS from FAOSTAT data.

Figure 3

Income growth and poverty reduction in India



*Average income growth rate for preceding 5 years.

Source: Economic Survey, Government of India, various issues.

emergence of a burgeoning middle- and upper-middle class consisting of more than 250 million consumers, including about 60 million living in the eight largest cities (Goldammer). This growing class of consumers has sufficient income to diversify and improve the quality of their diet. Moreover, with continued high income growth, there is also a maturing high-income segment of the population with the economic means and desire to purchase high-value and processed foods.

Pingali and Khwaja (2004) note the concept of income-induced diet diversification, where economic prosperity enables consumers to afford a more varied and balanced diet and also to demand nutritionally superior food products. Increased workforce participation by women is also contributing to rising household incomes, particularly in urban areas. New dietary habits emerging in India reflect global patterns and could be quite unlike the habits that developed locally over many generations. Pingali and Khwaja report an income elasticity of -0.05 for cereals in India, indicating that, for the country as a whole, declining shares of new income are being spent on traditional food grain staples. Consumers are exhibiting a preference for diversifying their diets to include a broader variety of foods. Since the early 1990s, non-staple foods, including dairy products, meats, edible oils, and fruit and vegetables, have been the fastest growing categories of food consumption. Although growth in apple consumption has remained sluggish, overall consumption of fruit grew about 5 percent annually during the 1990s.

High Apple Prices Reduce Demand

High prices for both domestic and imported apples compared with other domestically available fruit are a key reason for low per capita apple consumption. Although incomes are rising and poverty is declining, the bulk of the population still consists of low- and middle-income consumers who are highly sensitive to prices when purchasing consumer goods, including food. The average Indian household spends about 55 percent of its income on food, and consumer expenditure studies indicate that consumers readily substitute within and between food groups based on relative prices (Kumar, National Sample Survey Organization, Radhakrishna & Murty). For most Indian consumers—including much of the emerging middle class—price remains an important factor in determining the contents of the food basket.

Apples are generally the most expensive of India's major domestically produced fruits in most regions and seasons (table 2). Other major fruit, including bananas, mangoes, and oranges, are produced and consumed in larger quantities than apples, and their wholesale prices are significantly lower than apple prices in all seasons. Even in India's peak apple-harvest month of October, apple prices are higher than for other competing fruit. Bananas, with the highest per capita consumption, have by far the lowest price (fig. 4). Mangoes and oranges also have both lower prices and substantially higher per capita consumption than apples. Grapes, with about the same low level of per capita consumption as apples, are also expensive relative to the other fruit.

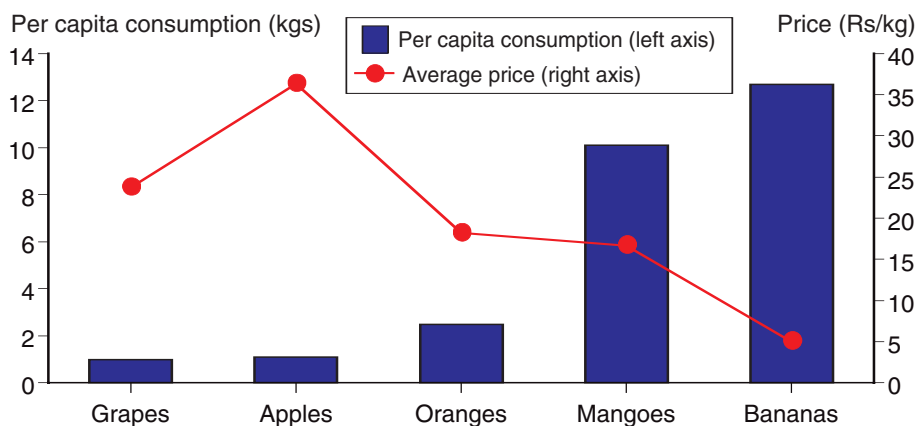
Table 2—Wholesale price comparison of India’s major domestic fruit, 2003

Month	Fruit	Bangalore	Mumbai	Kolkata	Delhi	Chennai
<i>Rupees/kilogram</i>						
January	Bananas	5.22	5.87	3.57	5.14	4.65
	Mangoes	--	--	--	--	--
	Grapes	22.54	21.43	25.59	27.99	18.92
	Oranges	20.92	25.06	13.94	21.13	18.71
	Apples	31.73	35.87	25.66	27.83	59.49
April	Bananas	5.26	5.5	3.8	8.53	4.73
	Mangoes	--	16.41	10.52	19.34	23.44
	Grapes	23.55	27.53	24.04	24.21	21.57
	Oranges	20.77	27.16	13.67	20.88	16.64
	Apples	39.26	--	36.84	28.42	64.75
July	Bananas	5.36	6.01	3.44	5.08	5.22
	Mangoes	22.02	15.78	15.32	12.65	13.87
	Grapes	--	--	--	--	--
	Oranges	--	--	--	--	--
	Apples	--	--	--	--	--
October	Bananas	5.28	5.87	3.26	4.1	4.74
	Mangoes	--	--	--	--	--
	Grapes	--	--	--	--	--
	Oranges	--	18.11	--	15.02	11.25
	Apples	34.78	32.15	23.81	25.68	36.40

-- = No price quoted.

Source: National Horticulture Board, Ministry of Agriculture, Government of India.

Figure 4
Per capita consumption and average wholesale price of major Indian fruits, 2003



Sources: FAOSTAT; National Horticulture Board, Ministry of Agriculture, Government of India.

The high relative prices for domestic apples in the Indian market reflect limited domestic supplies and the prevailing costs of domestic production. Significant marketing costs and trader margins also inflate apple prices, although it is not clear if these costs and margins are higher than for other domestic fruit. The substantially higher prices for imported apples, which are subject not only to import tariffs but also to even higher marketing costs

and margins than domestic apples, may also play a role in raising apple prices relative to other fruit. However, at this stage, apple imports account for a very small share of domestic consumption, so the impact of imports on average domestic market prices is likely to be small.

Estimates of the Income- and Price-Responsiveness of Apple Demand

To project and analyze trends in the Indian apple market, it is important to understand the strength of the relationships between apple demand, income growth, and apple prices. Available estimates confirm that apple demand is sensitive to changes in both incomes and prices. Sikka and Azad (1991) estimated income elasticities of demand for Indian fruit ranging between 0.11 and 1.31. Mango consumption was the most responsive to changes in income, followed by apple consumption. Devadoss and Wahl (2004) reported an income elasticity of demand for domestic apples in India of 1.05. Regression analysis based on 26 years of data on per capita apple consumption and real per capita income results in an income elasticity of demand estimate of 1.06, consistent with these other findings.¹

Devadoss and Wahl (2004) also provided an estimate of the responsiveness of apple consumption to changes in price, estimating an own-price elasticity of demand based on wholesale price data of -0.53. This is the only available estimate of the own-price elasticity of demand for apples in India and indicates that, on average, a 1-percent increase in apple prices results in about a 0.53-percent decline in the quantity consumed. Estimates of the relationship between the prices of other fruit and apple consumption (cross-price elasticities of demand) are not available, but could be expected to show a significant response as budget-constrained consumers adjust their fruit purchases based on changes in relative prices.

¹The equation estimated was:

$$\log APCC = -9.3 + 1.06 \log RPCI$$

(-5.098) (5.128) ($R^2 = 0.522$)

where logAPCC is the log of annual per capita consumption of apples and logRPCI is the log of real per capita income. The estimated income elasticity is 1.06. Numbers in parentheses are t statistics.

Apple Production

Indian apple production averaged nearly 1.4 million tons during 2002-04, making it the sixth largest apple producer in the world (table 3).² Its area is estimated to be the second largest in the world, while its average yield, about 5.5 tons³ per hectare, is the lowest of the major world producers. Production is concentrated in a few regions of northern India where the climate suits production of temperate zone crops, such as apples. Indian apple-producing regions are exposed to the variable precipitation associated with the sub-continent's monsoon climate, and producers also must contend with substantial annual fluctuations in producer prices.

Production Characterized by Slow Growth and Low Yields

Annual growth rates of India's area, production, and per hectare yield of apples have been decelerating since the 1970s (table 4). Although harvested area has expanded since 1990, declining average yields have slowed annual production growth to about 1.6 percent. Output growth has been slower than that of several major world producers, most notably China and Chile, but it has been near the average for the major world producers and significantly stronger than in the United States, France, and Italy (fig. 5).

Apples Are Produced on Mountainous Terrain

Apples are grown in temperate climates. To meet these conditions, nearly all of India's apples are grown in three mountainous States in north India—Himachal Pradesh, Jammu and Kashmir, and Uttaranchal Pradesh (a newly formed State, formerly part of Uttar Pradesh)—where they are typically grown at altitudes of 4,000 to 11,000 feet (fig. 6, table 5). Himachal Pradesh and Jammu and Kashmir each have roughly equal area planted to apples, but Jammu and Kashmir has the highest average yield and accounts for about two-thirds of total production. In Himachal Pradesh, apples are mostly

²The production data include apples destined for the fresh market and for processing into juice or other products. In some countries, such as China and Australia, a significant share of production goes for processing while in others, such as India, most production is marketed as fresh apples.

³Throughout the report, all tons are metric tons.

Table 3—Area, yield, and production for major world apple producers, 2002-04 average

Country	Area <i>1,000</i>	Yield <i>Metric tons/ha.</i>	Production <i>1,000 metric tons</i>
China	2,047	9.9	20,286
United States	162	24.9	4,021
Turkey	109	21.4	2,333
France	78	29.8	2,323
Italy	60	33.9	2,052
India	247	5.5	1,367
Chile	36	30.1	1,083
Japan	42	21.1	883
South Africa	26	24.8	644
New Zealand	12	43.0	527
Australia	32	10.1	324

Source: FAOSTAT.

Table 4—Trends in India's area, production, and yield of apples

Period	Area	Yield	Production
	<i>Hectares</i>	<i>Metric tons/ha.</i>	<i>1,000 metric tons</i>
69-71 average	66,700	4.15	276,667
79-81 average	138,387	5.16	713,937
89-91 average	189,165	5.91	1,117,674
02-04 average	246,667	5.54	1,366,667
<i>Growth rates (percent) 1/</i>			
1970s	7.6	2.2	9.9
1980s	3.2	1.4	4.6
1990-2003	2.1	-0.5	1.6

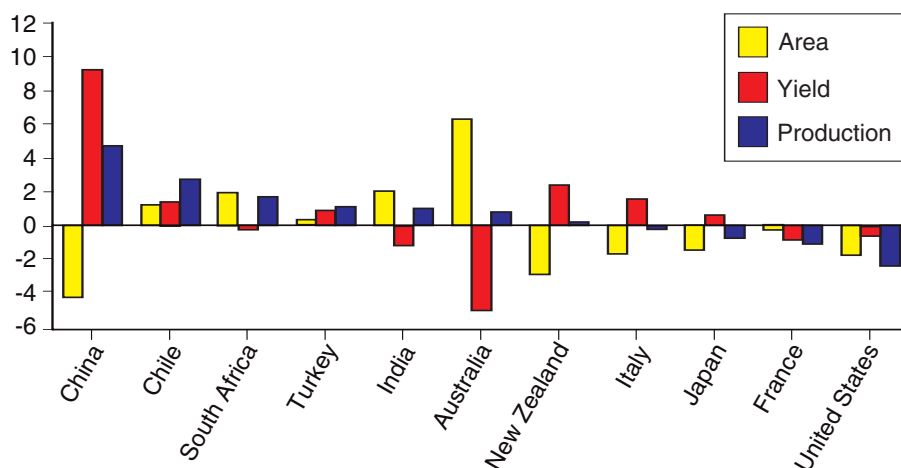
¹Growth rates between 3-year averages centered on the years indicated.

Source: Computed from FAOSTAT data.

Figure 5

Growth in apple area, yield, and production for major producers, 1995-2003

Annual growth rate (Percent)



Note: Growth rates computed between 3-year averages centered in 1995 and 2003.

Source: Computed from FAOSTAT data.

Table 5—Indian States' apple area, production, and yield, 1998/99-2000/01 average

State	Area	Yield	Production
	<i>1,000 ha.</i>	<i>Metric tons/ha.</i>	<i>1,000 metric tons</i>
Himachal Pradesh	87.7	3.1	273.1
Jammu & Kashmir	86.1	9.6	824.0
Uttaranchal Pradesh	55.9	2.0	109.7
Others	6.8	1.7	11.5
Total	236.5	5.2	1,218.1

Source: National Horticulture Board, Ministry of Agriculture, Government of India.

Figure 6

India's apple-growing areas



Source: ESRI® Data & Maps, 2004 and USDA/ERS.

India's Johnny Appleseed

Indigenous varieties of apples have been grown in India for centuries in the northern State of Kashmir. During the British Raj, English officers introduced strains of the English sour apples to India, but these were not popular because of their taste. The real beginning of apple production in India was in the early 20th century when Samuel Evans Stokes of Philadelphia landed in India, originally to join the Leprosy Mission of India. He settled in the area of Kotgarh and Thanedar in the present day state of Himachal Pradesh. He married a local woman, studied the Hindu religious text, and changed his name to Satyanand Stokes.

In 1916, based on his study of apple cultivation in the United States, Stokes became convinced that apple cultivation would improve the lot of local farmers. He imported saplings of the Stark Brothers' Delicious variety of apples from the United States for cultivation in Himachal Pradesh, and this variety became popular among Indian consumers (Mehta, 2003). Stokes, like John Chapman—better known as Johnny Appleseed—in the United States in the 18th century, became an Indian legend known for planting and supplying apples to the farmers in Himachal Pradesh.

grown in cold and dry zones and in the high hills and valleys. In Jammu and Kashmir, which is farther north, apples can be grown in less mountainous terrain. Production in the newly formed state of Uttaranchal, formerly part of Uttar Pradesh, is primarily in mountainous districts. The remaining small amounts of production occur in the hill regions of northeastern India, in the States of Arunachal Pradesh and Nagaland.

There is uncertainty regarding the accuracy of Indian apple production statistics at the state level (table 5). Some Indian scientists claim that these government data overestimate area, and understate yields, by counting the total area of hilly regions—including land with no apple trees—as production areas. In addition, area estimates may also include new orchards and/or trees that are not yet productive. Factoring out these areas, they claim that a conservative estimate of yield in Himachal Pradesh is about 15 tons per hectare, or about 5 times the official estimate. Even with these adjustments, however, yields would be low compared with most other major producers.

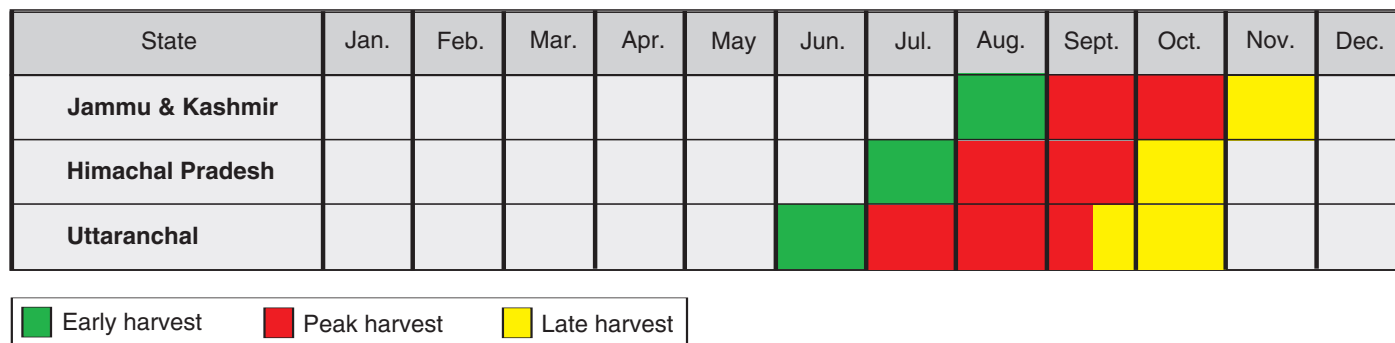
Harvest Activity Concentrated in August-October

Most of the apples grown in India are variants of the Red Delicious or Royal Delicious varieties and have similar maturity periods of about 125 to 134 days from the time of flowering. Although some harvest activity begins as early as June, the bulk of the harvest occurs during September and October (fig. 7). In the largest producing State (Jammu and Kashmir), the harvest continues between August and November, with peak activity in September and October. In the second largest producing State (Himachal Pradesh), the harvest extends from July to October with peak activity during August and September. For the relatively small producing region of Uttaranchal, harvest begins in June and extends to October, with the bulk of the picking occurring from July to mid-September.

Most Orchards and Cultivars are Old

Most apple orchards in India are 30 years old or older and are characterized by declining yield and lack of fruit uniformity in terms of shape, size, and color. The low productivity and poor quality of apples is linked to monoculture of a few old cultivars that have degenerated over the years. For example, in Himachal Pradesh, only a few old cultivars, such as Royal

Figure 7
India's apple harvest season for major producing States



Source: National Horticulture Board, Ministry of Agriculture, Government of India.

Delicious, Red Delicious, and Rich Red, account for most apple area. Farmers are increasingly concerned about problems with apple scab disease, outbreaks of premature leaf fall, and infestations of red spider mite on these varieties. Although more than 700 accessions of apples introduced from abroad have been tried and tested during the last 50 years, the Delicious group of cultivars still accounts for about 83 percent of production in Himachal Pradesh and more than 45 percent in Jammu and Kashmir.

Some progress has been made in identifying suitable early, mid, and late apple cultivars for different agro-climatic regions. For example, the Kumaon Hills division of Himachal Pradesh has achieved a unique advantage by cultivating early-maturing varieties like Early Shanburry, Fanny, and Benoni. These varieties are harvested 2-3 weeks before those in other areas and, hence, receive relatively high prices.

Many Factors Reduce Apple Yields

In addition to mountainous terrain and outdated cultivars, yields are also constrained by other factors, including erratic moisture conditions, weather damage, and low use of fertilizer and pesticide inputs:

- *Erratic moisture and poor water use efficiency:* India's monsoon climate provides highly seasonal and erratic rainfall in apple-producing areas. The mountainous conditions reduce the efficiency with which available moisture is used by the crop, and the erratic moisture conditions complicate pest control measures.
- *Low use of fertilizer:* Fertilizer use is typically below recommended levels, and the efficiency of nutrient use by the crop is low, also because of the terrain.
- *Weather:* Weather conditions, such as spring frost and hailstorms, reduce productivity.
- *Price variability:* In India's apple-marketing system, producers receive a residual price determined after the harvest is sold in the primary market. Producers, therefore, face significant price risk that limits their investment in variable and fixed inputs (see section below on apple marketing).

Research results have shown that current yields can be doubled through use of modern orchard management practices, including improved moisture conservation and fertilizer application. Technologies such as use of clonal rootstocks, renewal pruning techniques, and micro-nutrient application also can improve yields. At present, however, these technologies are generally not used by growers.

Apple Output Growth Slow Compared with Other Fruit Crops

Gains in apple production have been slower than for other major Indian fruit since 1990 (table 6). Growth in apple area has been slower than for any fruit except oranges. Apples also have the lowest average yield of all of the major fruit and, along with mangoes and papayas, have experienced declining yields since 1990.

The slow growth in apple production compared with other fruit is indicative of the difficulties in boosting both area and yield in the regions where they are grown. It also reflects the low priority traditionally given to government research and extension efforts for apples and other horticultural crops compared with food staples such as wheat and rice. The sluggish growth in apple production helps to explain the high price and slow rise in consumption of domestic apples compared with other fruit.

Table 6—Growth rates of area, yield, and production for major Indian fruit, 1990-2003

Fruit	Area	Yield	Production
	<i>Percent per year¹</i>		
Apples	2.1	-0.5	1.6
Bananas	5.0	1.7	6.8
Grapes	6.5	2.2	8.8
Mangoes	4.2	-2.5	1.7
Oranges	0.1	3.6	3.7
Papayas	6.3	-1.7	4.5

¹Annual growth rates for period between 3-year averages centered on the years indicated.
Source: Computed by ERS from FAOSTAT data.

Apple Trade

India eliminated quantitative import restrictions on apples in April 1999, when imports of apples and other fruit were opened to private trading under Open General License (OGL). Imports, which are sold at significantly higher prices than domestic apples, are rising at a fast pace, but remain small compared with domestic production. The United States and other major suppliers, primarily Australia, China, and New Zealand, are competing for shares of the market. Trade patterns are being affected by import prices, tariffs, and seasonal factors, while non-tariff policies—particularly phytosanitary measures—are potential future factors.

Apple Imports Small but Rising

Apple imports have grown rapidly since the removal of quantitative restrictions in 1999, but remain a small component of total consumption. Imports rose steadily during 1999-2003 (calendar years)—peaking at more than 22,000 tons in 2003—before slipping to under 16,000 tons in 2004. The decline in 2004 appears to have stemmed from reduced supplies and higher prices from some suppliers, particularly the United States and Australia (table 7). Partial data for shipments from the U.S. 2004/05 crop suggest a strong rebound in calendar year 2005 with record high Indian apple imports.

U.S. apples imported by India are primarily Washington Red Delicious, with relatively small amounts of Golden Delicious and other varieties. Apples from Australia and New Zealand are mostly Gala or Red Delicious varieties. Chinese apples are primarily of the Fuji variety.

U.S. Apples Hold Largest Share of a Competitive Market

India imports apples from many suppliers in both the northern and southern hemisphere, and most suppliers have seen their shipments to India grow during 1999-2004. On average, the United States has been the largest supplier of apples to India, accounting for about a third of India's imports during 1999-2004.⁴ Australia (a 23 percent share during 2002-2004), China

⁴India accounted for about 1.5 percent of U.S. apple exports in 2002 and about 2.3 percent in 2004.

Table 7—Indian apple imports by country of origin (calendar years)

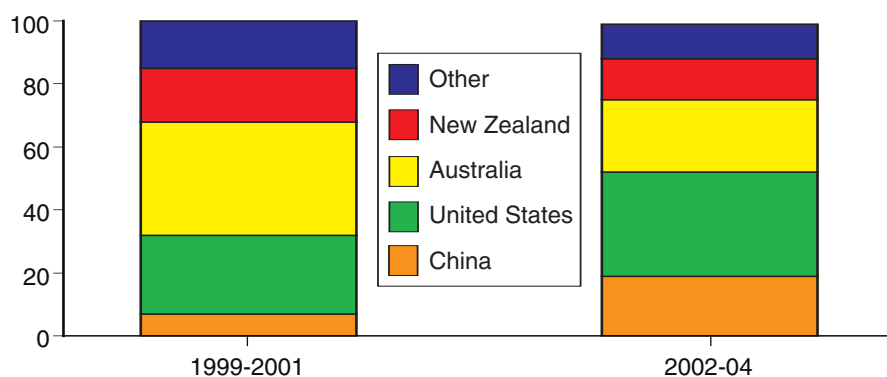
Country	1999	2000	2001	2002	2003	2004
<i>Metric tons</i>						
Argentina	0	0	108	340	420	142
Australia	66	2,376	4,202	4,579	6,957	1,869
Bhutan	0	0	0	0	551	0
Chile	50	0	176	25	100	1,489
China	40	75	1,146	3,293	3,492	4,403
France	0	114	257	319	68	0
New Zealand	454	976	1,648	2,357	2,774	2,682
South Africa	89	355	534	271	493	1,288
United States	647	420	3,627	8,323	7,037	3,892
Other	178	231	825	587	160	79
Total	1,523	4,546	12,524	20,093	22,052	15,846

Source: World Trade Atlas.

Figure 8

Exporters' shares of India's apple imports

Market share (Percent)



Source: World Trade Atlas.

(19 percent), and New Zealand (13 percent) have been the other major suppliers. Although U.S. sales and market share in India have expanded, China's market share has shown the most growth, rising from an average of 7 percent during 1999-2001 to 19 percent during 2002-2004 (fig. 8). In 2004, China was the largest supplier of apples to India. Australia and New Zealand, while expanding sales, have tended to lose market share.

India's pattern of imports from alternative suppliers is similar to that of other Asian apple import markets, with a few significant exceptions (table 8). The U.S. share of the Indian market is approximately the same as the 31-percent average market share held by U.S. apples in the major Asian apple markets. Despite the recent growth in imports from China, however, India still imports a smaller share of its apples from China—and a larger share from Australia—than do other Asian countries.

Over time, it is likely that Australia's share of the Indian market will continue to fall. With a little more than 25,000 tons of annual exports of fresh apples, Australia has a relatively small exportable surplus and limited scope to expand (USDA, 2003). By contrast, there appears to be broad scope for China's market share to continue to expand for fresh apples. China's role as the world's largest producer and its intra-industry trade

Table 8—Selected Asian countries, apple imports and major exporter market shares, 2002-04 average

Importers	Total imports	United States	China	New Zealand	South Africa	Chile	Australia	Other
	<i>Metric tons</i>							
								<i>Market share (Percent)</i>
China	44,969	44	--	22	0	33	0	1
Hong Kong	96,232	38	32	10	5	12	1	2
<i>India</i>	<i>19,330</i>	<i>33</i>	<i>19</i>	<i>13</i>	<i>4</i>	<i>3</i>	<i>23</i>	<i>5</i>
Indonesia	89,730	38	53	4	0	0	1	4
Malaysia	78,727	10	46	9	22	1	6	6
Philippines	51,837	4	91	0	0	0	1	4
Taiwan	114,412	52	0	13	1	17	1	16
Thailand	74,036	13	76	3	5	0	0	3
Average	71,159	31	39	9	5	8	2	6

Source: World Trade Atlas.

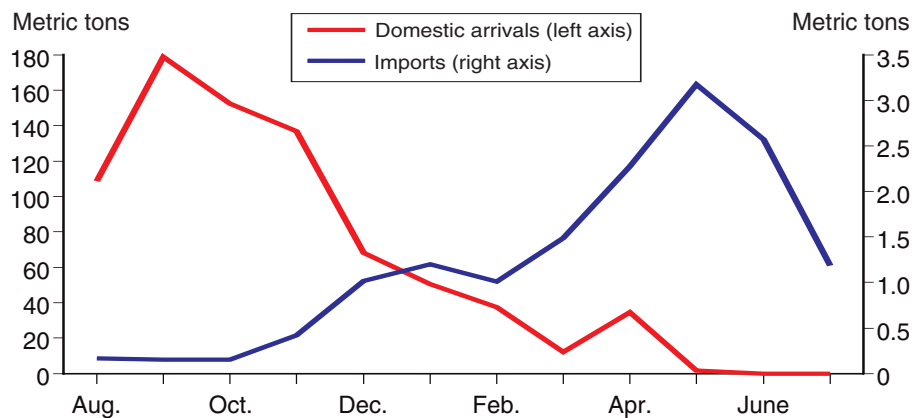
pattern for apples—it is a significant exporter and importer in Asian markets—provide flexibility to expand exports. In addition, although Indian consumers initially balked at the unfamiliar pinkish color of Fuji apples exported by China, the Chinese apples are highly competitive in the Indian market on the basis of price and increasingly accepted on the basis of quality.

Seasonal Factors Influence Trade

Indian apple imports have followed a clear seasonal pattern, with few imports arriving during the peak domestic harvest and market arrival months of August–November, and rising imports during the domestic lean season of December–July (fig. 9). The bulk of imports arrive during April–June—the final months of the marketing year for domestic apples—but there has been a modest trend toward more imports in earlier months (fig. 10).

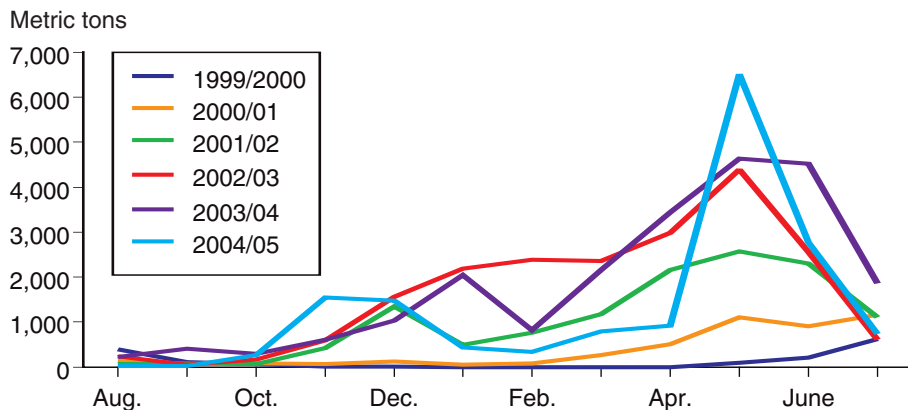
Although there have been no significant imports during the peak domestic harvest months so far, the fact that imported apples are sold at significantly

Figure 9
India’s apple market: Monthly domestic market arrivals and imported apples, 2000-03 average



Source: World Trade Atlas. National Horticultural Board, Ministry of Agriculture, Government of India.

Figure 10
Monthly total Indian imports of apples by crop year



Source: World Trade Atlas.

higher prices than domestic apples in other seasons suggests that they might be marketed during the harvest season as well. A likely reason that imports drop during the harvest months is that the combination of seasonally low domestic prices and seasonally high import prices presents a less attractive opportunity for importers. Importers choose not to import during this period rather than try to sell at larger premiums over domestic apples or accept reduced margins on imported apples.

India's short apple harvest period, combined with the rapid quality deterioration of domestic apples due to limited use of cold storage, creates a broad window of opportunity for marketing imported apples. In contrast to domestic apples, imported apples maintain their quality largely because of a superior cold chain. Imported apples remain in their refrigerated container until they reach their major urban destination—primarily Mumbai, Delhi, Chennai, or Kolkata—and then, because of their high value, are held in cold storage until they are sold to a wholesaler.

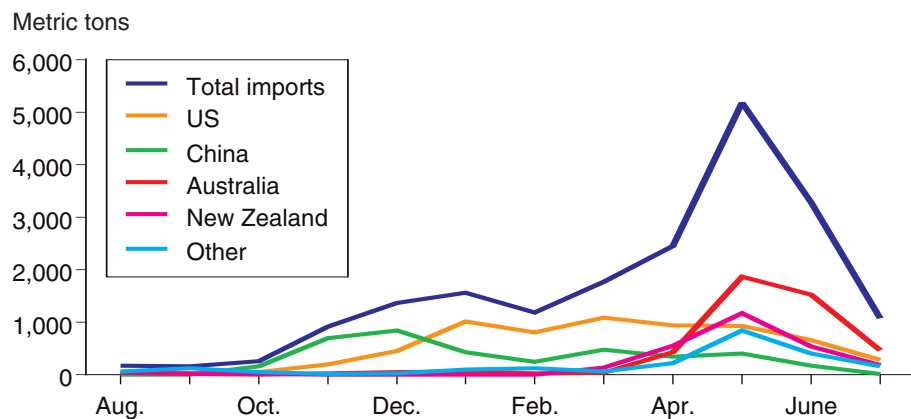
India's seasonal import pattern is consistent with the U.S. and Chinese apple export seasons, which stretch from November to July, and both the United States and China export apples to India throughout this period (fig 11). U.S exporters, however, currently have an advantage over China in the form of superior cold storage and supply chain infrastructure, which provides the capability to export significant volumes throughout the marketing year. By contrast, Australia and New Zealand, southern hemisphere countries with spring apple harvests and relatively small exportable surpluses, export to India in a narrow window during April-July.

Apple Tariff High Relative to Other Fruit

When quantitative restrictions were removed and apple imports were placed on Open General License (OGL) in 1999, India's applied tariff was initially set at 40 percent, then moved up to the 50-percent bound rate—the maximum rate permitted by the World Trade Organization—in 2000. India's tariff on apples is the highest among the major fruit that it produces domestically.⁵ All other fruit face tariffs of either 30 percent or 25 percent (fig. 12).

⁵India's high tariff on apples compared with other fruit stems from the geographic concentration of the apple industry in two States and the presence of government parastatal marketing agencies (Himachal Pradesh Produce Marketing Corporation and the Jammu and Kashmir Horticultural Produce Marketing Corporation) in these States. As a result, the apple industry is relatively well organized and has a more effective voice in trade policy formulation.

Figure 11
Monthly Indian imports of apples by supplier, 2002-04 average



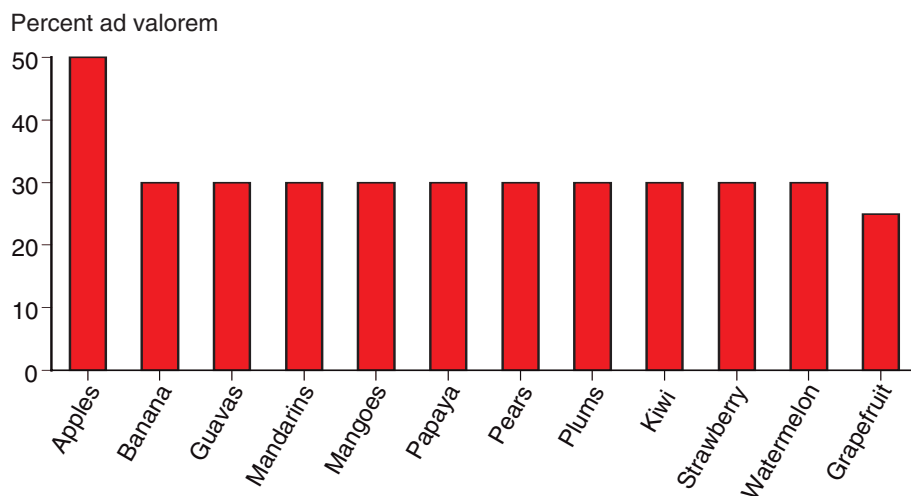
Source: World Trade Atlas.

India's apple tariff is high not only compared with other Indian fruit, but also compared with the tariffs on apples in other countries, both developed and developing (fig. 13). The only major apple-producing country with a higher tariff than India is Turkey (60.3 percent). Tariffs in other major producing or consuming countries range from zero (United States and New Zealand) to 17 percent (Japan).

Nontariff Measures Could Affect Trade

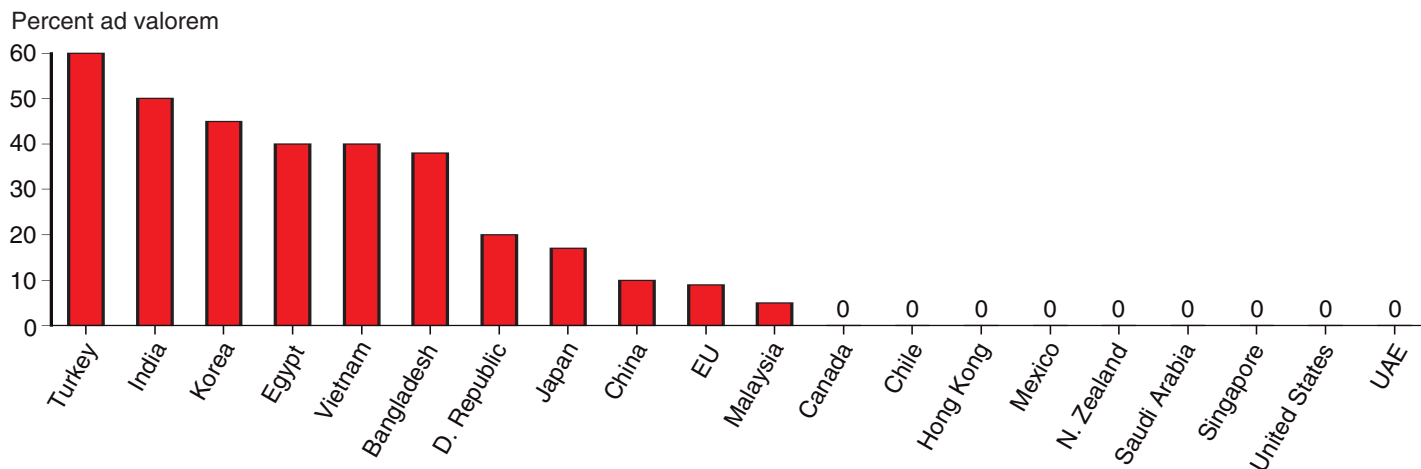
India has a number of regulations related to plant health and food safety that apply to apple imports. For the most part, these measures did not come into play during the period of quantitative restrictions because little trade occurred. With the removal of quantitative restrictions, regulations are in the process of being updated, and enforcement mechanisms are being established. So far, the enforcement of plant health and food safety regulations has not led to any major disruptions of apple shipments, but importers face transaction risks due to uncertainty regarding the interpretation and enforcement of the regulations. The major nontariff measures applicable to apple imports are:

Figure 12
Indian import duties on fresh fruit*



*Rate of duty is 10 percent lower for preferential areas.
 Source: Central Board of Excise and Customs, Government of India.

Figure 13
Import duties for apples, selected countries



Source: Northwest Horticulture Council (NHC).

- **Plant quarantine regulations:** During 1999-2003, apples imported from the United States had to be accompanied by a standard phytosanitary certificate issued by USDA's Animal and Plant Health Inspection Service (APHIS). In 2003, the Government of India (GOI) promulgated the Plant Quarantine (Regulation of Import into India) Order, which it began to enforce on January 1, 2004. The order established new import procedures and quarantine requirements, including a detailed list of plants and plant materials permitted for import with additional declarations and special conditions. For apples, in addition to the usual phytosanitary certificate, the GOI requires an additional declaration that shipments are free of specific pests,⁶ as well as a certificate that the shipment meets other specific conditions.⁷
- **Pesticide residue regulations:** Imported apples are required to comply with national standards on pesticide residues under the Prevention of Food Adulteration Act (PFA) (table 9). In cases where India's regulation does not specify a maximum residue level (MRL) for a particular pesticide, India follows the Codex standard. For example, for Ethephon—a spray commonly used by Indian farmers to enhance red color—Indian regulations do not specify a standard and the Codex norm applies. Although Indian standards are generally not as strict as in the European Union, Indian standards tend to be more strict than in the United States. For example, for Captan, Malathion, and Benomyl, Indian MRLs are lower than those of the United States. Such divergences could be a potential trade barrier.
- **Apple waxing regulations:** An Indian regulation on food waxing is also a potential impediment to apple imports. Waxing is a process that helps preserve quality, lengthen shelf life, and improve appearance of fruit and vegetables; it is a common practice in a number of countries. In August 2003, India's Department of Health issued a draft notification indicating that fresh fruit should be free of wax coating, mineral oils, and added coloring. Although waxing of domestic apples is not a widespread practice in India, the regulation of waxing surprised traders, in part because the Himachal Pradesh Horticultural Produce Marketing and Processing Corporation, a parastatal entity engaged in apple marketing, owns and operates waxing facilities. A ban on waxing could be highly disruptive to imports of apples, as well as pears and other fruit imported by India. The major exporters of apples to India—the United States and Australia—generally ship waxed apples. China and New Zealand are the only major exporters supplying unwaxed apples.

⁶Imported apples must be free of: 1) *Ceratitidis capitata* (Mediterranean fruit fly), 2) *Cydia pomonella* (codling moth), 3) *Epiphyas postvittana* (light brown apple moth), 4) *Erwinia amylovora* (fire blight), 5) *Pseudococcus calceolariae* (Scarlet mealy bug), 6) *Pseudococcus comstocki* (Comstock mealy bug), and 7) *Rhagoletis pomonella* (apple maggot).

⁷Special conditions are: 1) Pest-free area status for *Rhagoletis pomonella* (apple maggot) and *Ceratitidis capitata* (Mediterranean fruit fly) as per international standard, or 2) Preshipment cold treatment at 0 deg centigrade or below for 10 days; or 0.55 deg C or below for 10 days; or 1.1 deg C or below for 12 days in transit refrigeration against *Rhagoletis pomonella* (apple maggot) and *Ceratitidis capitata* (Mediterranean fruit fly).

Table 9—Maximum residue levels (MRL) for apples

Chemical	United States	Codex	European Union	India
<i>Parts per million</i>				
Ethephon	5.0	5.0	3.0	NS
Benomyl	7.0	5.0	2.0	5.0
Endosulfan	2.0	1.0	0.3	2.0
Dodine	5.0	5.0	1.0	5.0
Malathion	8.0	2.0	0.5	4.0
Captan	25.0	25.0	3.0	15.0

NS = Not specified.

Sources: Ministry of Health and Family Welfare; Northwest Horticulture Council (NHC); FAOSTAT database.

So far, the restriction on waxing is still under study and review and has not been enforced. If waxing is to be permitted, perhaps the key issue to be addressed is how to prevent the use of nonfood grade waxes and, since a large share of the population is vegetarian, the use of animal-based waxes. It is not clear when the waxing question will be resolved and what rules will eventually be enforced, but it looms as a potential barrier to trade. Enforcement of a ban on waxing may affect the quality and competitiveness of U.S. apples the most because U.S. apples have longer shipping times than apples from the other major suppliers.

The extent to which these plant health and food safety regulations will eventually emerge as barriers to trade is uncertain and remains a source of risk for traders engaged in apple imports. Although there is uncertainty regarding interpretation and enforcement of rules, India's regulations appear not to be significantly out of line with those employed by other apple-importing countries. Some countries, including Australia, Chile, and Korea do not allow imports of apples at all. Others, such as China and Japan, have had highly restrictive phytosanitary protocols (Krissoff, Calvin, Gray, 1997).

Measures of Protection for Indian Apples

Measurement of the level of protection for traded goods requires comparison of domestic and world reference prices for like goods at the same point in the marketing chain. Because of the substantial difference in quality between India's domestic apples and imported apples, it is difficult to accurately assess the level of protection afforded to Indian apples by India's 50-percent tariff and other border measures.

Domestic and imported apple price data for 2003 (table 10) indicate that domestic wholesale prices in Mumbai (Rs34.97/kg) were about 20 percent higher than the average prices (exclusive of tariffs) for major suppliers, which ranged from Rs27.79/kg for Chinese apples to Rs31.50/kg for New Zealand apples. For a more correct assessment, however, it is necessary to compare the prices at the same point in the marketing chain by accounting for the clearing charges, importer margins, agent commissions and other costs of moving imported apples from the port to the wholesale market. The ratio between the domestic wholesale price and the import price, adjusted for marketing costs to the same wholesale market, is known as the Nominal Protection Coefficient (NPC).⁸

Table 10—Competitiveness of major apple exporters to India, 2003

Supplier	Unit price ¹	Standard deviation	Coefficient of variation
	<i>Rs/kg</i>		<i>Percent</i>
China	27.79	2.55	9.2
United States	28.31	2.70	9.5
Australia	28.71	2.36	8.2
New Zealand	31.46	1.44	4.6
India	34.97 ²	4.60	13.2

¹Average monthly CIF prices; Directorate General of Commercial Intelligence and Statistics, Government of India. March unit value excluded as an outlier.

²Average wholesale price of domestic apples in Mumbai market.

⁸The NPC is defined as (P_d / P_b) , where P_d is the domestic price and P_b is the border, or adjusted, import price. The domestic price is measured in local currency at the wholesale market and the border price is the world price at the same market location, exclusive of customs duty but adjusted for costs of bringing the product to the wholesale market. In the absence of tariff and nontariff barriers or quality differences, the border price and domestic price would be the same, and the NPC would equal 1.0. If quality is equal, the higher the NPC, the higher the protection offered to the domestic product.

The estimated NPC for Indian apples based on 2003 average price data is 0.93, indicating that the domestic price of India's relatively low-quality apples is below the price of imported apples at the same point in the marketing chain (table 11). The NPC of 0.93 is also well below the expected value of 1.50 that would be consistent with a 50-percent tariff and goods of equal quality. In an attempt to account for the quality difference, we also calculated the NPC based on import and domestic price data for the peak harvest month of September, a period when the quality of Indian apples is most competitive with imports. The NPC of 0.74 based on September data, however, shows an even lower level of protection for domestic producers.

The NPC analysis indicates that, at least as long as there is such a large quality difference between domestic and imported apples, the 50-percent tariff and other border measures appear to afford little or no protection to domestic producers, as well as little or no burden on consumers of domestic apples.

Quality and Price Create Separate Markets for Domestic and Imported Apples

Low prices for domestic apples, despite the presence of a 50-percent tariff and relatively high-priced imports in the market, are due to the large difference in quality between domestic and imported apples. Because of superior cold chain infrastructure, imported apples arrive in Indian retail outlets in fresh, crisp, and juicy condition throughout the marketing year. Equivalent-quality domestic apples, in contrast, are generally available only during the August-November harvest season because they do not benefit from refrigerated storage and transport. In south India and other areas distant from producing regions, the availability of quality domestic apples is even more limited. Imported apples generally look better than domestic apples because of uniformity of size, color, and shape, as well as very low levels of latent damage due to higher quality packing. Although a few Indian growers are now upgrading their practices, domestic apples are typically transported, handled, and stored in poor quality packaging with significantly higher levels of damage to the fruit.

The distinct differences in price and quality between domestic and imported apples are evidence that domestic and imported apples are differentiated products traded in largely separate markets. Although it is reported that the

Table 11—Nominal protection coefficients for Indian apples

	Annual average	September
	<i>Rs/kg</i>	
1. Import price ¹	29.10	30.30
2. Marketing costs ²	8.57	9.04
3. Import price at wholesale market	37.67	39.34
4. Average Mumbai wholesale price	34.97	29.21
5. Nominal protection coefficient (NPC) ³	0.93	0.74

¹Average import unit value for all suppliers.

²Includes port clearance and marketing costs and margins to Mumbai wholesale market.

³Nominal protection coefficient = row 4/row 3.

Source: Directorate General of Commercial Intelligence and Statistics, ERS estimates from trade sources.

presence of high-priced imported apples is now beginning to stimulate quality improvements by a few growers, there remains a large gap in terms of both quality and price (Hindu Business Line). And, there is no evidence that purchases of high-priced imported apples by high-income consumers are weakening demand or prices for domestic apples.

Apple Marketing

Almost all apples produced in India are used for fresh consumption, with only small quantities used for processing into products such as apple juice, jelly, or jam. Although there are a few government agencies and cooperatives, such as the Himachal Pradesh Horticulture Produce Marketing and Processing Corporation (HPMC), involved in apple marketing, most apples are sold through private marketing channels comprised of a large number of small-scale brokers and merchants. Information collected during field research suggests that India's apple marketing system entails significant marketing costs and, particularly, significant marketing margins for both domestic and imported apples.

Grower Price Risk Impedes Marketing Improvements

Most Indian apple production takes place in the hilly northwestern States and about 70 percent of the crop is transported to and sold in India's largest wholesale fruit and vegetable market at Azadpur in Delhi. The major marketing channels for apples is for growers to harvest and pack their crop and ship it 1-2 days by unrefrigerated truck to the Azadpur market, where the consignment is then handled and sold by a commission agent. Growers have an option of selling at the prevailing market price or paying for storage in the hope of getting a higher price at a later time. When the produce is sold, all marketing costs, including transport, handling, and storage costs and the agent's commission are deducted and a net price is paid to the grower.⁹ Although it is typical for growers and agents to develop relationships involving credit and marketing advice, the marketing system places the bulk of the price risk on growers. This risk likely reduces incentives for growers to invest in improved production, harvest, and post-harvest practices.

Another common marketing channel involves growers' selling their crop to a contractor prior to harvest, typically during the flowering stage when there is some information on overall crop size. The contractor, who may also be linked with agents or merchants in the wholesale market, then harvests and transports the crop to the market in Delhi. This approach transfers some of the price risk to the contractor. Grower marketing cooperatives and government-controlled marketing corporations, primarily the HPMC in Himachal Pradesh, are also involved in apple marketing. However, only about 3.5 percent of production is handled by grower cooperatives, and the HPMC handles only about 2.5 percent of the Himachal Pradesh crop.

For India's other major urban centers, including Mumbai, Kolkata, and Chennai, the marketing system works in much the same way. Growers or contractors in the producing areas transport shipments by unrefrigerated truck to commission agents in these markets and then receive a net price once the sale is completed. For smaller urban and regional markets, apples are purchased from wholesale traders and merchants in Delhi or the other major urban centers.

⁹Growers generally have little control over marketing costs. Truck rates are determined by local market conditions during harvest. Handling and commission costs are standard to each market. Growers do have the option of selling immediately or storing at prevailing rates at the primary market.

Once they are turned over to the commission agent in the primary market, apples typically move through several owners, including wholesaler, sub-wholesaler, and retailer, before reaching the consumer. At each step in the marketing chain, the primary role of the intermediary is to arrange transport and handling, bring together sellers and buyers, and facilitate the financial transaction. Value addition in the supply chain is negligible and consists primarily of breaking shipments into smaller and smaller lots for onward sale.

A few government cooperatives, most notably the “Safal” fruit and vegetable marketing project operated by the National Dairy Development Board in the Delhi region, have sought to develop a more modern and integrated marketing chain for fruit and vegetables, but these account for only small shares of the market. While India’s apples and other fruit are marketed almost entirely by the private sector, so far, there has been little private investment in improving the quality of domestic apples to compete with imports. There are currently no large-scale or integrated private firms that market apples or other fruit at either the regional or national level. Supermarkets and chain retailers, as well as the supply chain integration and efficiency they foster, remain nascent in India, accounting for less than 5 percent of total consumer food purchases.

Post-Harvest Handling Practices Are Poor

For the most part, the post-harvest practices followed by Indian growers and contractors are poor compared with those followed in the United States and other major producing countries. In the past, incentives to improve post-harvest practices were weak, likely because of the limited domestic market for higher quality and higher priced products, as well as the price risk faced by growers and contractors. Although there is some evidence of a few growers’ improving their practices to take advantage of the emerging market for higher quality products, the following practices characterize the marketing of most domestic apples:

- *Storage.* Apples are ordinarily not held in cold storage in the producing area. Apples not sold immediately by growers and those held for later sale by wholesale merchants may be held in cold storage in Delhi or other major markets. Although high-quality cold storage exists in most major markets, apples that are stored are generally stored in cheaper facilities with less control over temperature and atmosphere.
- *Grading.* Most growers do not grade onfarm, and grading is not common in the marketing chain, although some growers, harvest contractors, and wholesalers grade apples based on either color or size. Himachal Pradesh authorities have prescribed standards for seven size grades, but these are not used in the trade. Retailers may also sort out high- and low-quality fruits before sale. Price differences observed in primary and wholesale markets are primarily based on visual inspections of the boxes in the lots being traded.
- *Packaging.* Packing sizes are boxes of roughly 20 kgs. Many different packing materials are used, including thin wooden crates with straw packing, corrugated cardboard boxes, and trays of various qualities. Use of high-quality boxes and trays with sufficient rigidity to protect the fruit

is limited. Overstuffed boxes containing significant amounts of bruised fruit are common.

- *Handling and transport.* With very few exceptions, domestic apples are transported throughout India in unrefrigerated trucks over poor roads, whether it is a 1-2 day trip from Jammu and Kashmir or Himachal Pradesh to Delhi or a 4-5 day trip to Chennai. Growers generally face shortages of trucks during the peak harvest period, leading to periods of unrefrigerated storage in producing areas. Trucks are often loaded beyond the stipulated legal and safe norms. In combination with poor quality packing materials, overloading leads to heavy pressure on the fruit and damage during transport. Lack of refrigeration, long journey times, and poor packaging reduce the quality of domestic apples available in more distant markets, including Mumbai, Chennai, and Bangalore.

Wholesale Price Formation

Wholesale markets play a key role in the determination of both domestic and imported apple prices. Under the provisions of the Agricultural Produce Marketing Acts in place in most States, all agricultural produce must be sold in markets built and regulated by the government. Markets are managed by local Agricultural Produce Marketing Committees in accordance with central, State, and local government regulations.

Prices are generally determined in these markets by auction. Auctions are often not conducted in a transparent manner and are prone to manipulation due to secret bidding practices. One common practice observed in apple trading at Azadpur, Delhi is for two parties to negotiate price by holding hands under a cloth, signalling bid-ask quotes through finger movements. Although the Azadpur market reports volumes sold and average prices at the end of each day based on information supplied by the traders, the actual transaction prices are known only to the buyer and seller. These practices do not necessarily result in prices that are divorced from overall supply and demand conditions over the longer term, but they impede the flow of accurate information and limit competition that might reduce trader margins.

Data on domestic market arrivals and average prices of apples in India's major wholesale markets for 2003 provide a picture of the size of the major markets, price differences across regions, and the variability of prices in each market (table 12). Delhi and Mumbai dominate wholesale trading in apples, with Bangalore, Kolkata, and Chennai accounting for relatively small shares. As would be expected, average prices are lowest in Delhi, which is closest to producing areas, and highest in Chennai, which is farthest from producing areas. Average prices for Mumbai, Bangalore, and Kolkata, however, appear not to be correlated with distance from the Delhi market. Differences in quality or timing of shipments from producing areas may also affect average prices in those markets. Price variability, as reflected in the standard deviations and coefficients of variation, is high for Indian apples, particularly in the most distant market of Chennai. Overall price variability for domestic apples appears higher than for imported apples (as measured by import unit values).

Table 12—Wholesale apple prices and domestic market arrivals at major cities in India, 2003

City	Average price 1/	Standard deviation	Coefficient of variation	Total arrivals
	<i>Rs/kg</i>			<i>1,000 metric tons</i>
Delhi	26.59	3.72	14.00	760
Mumbai	34.97	4.60	13.20	109
Bangalore	33.78	4.73	14.00	36
Kolkata	28.79	5.22	18.10	31
Chennai	45.93	17.65	38.40	12

Source: Computed from National Horticulture Board, Ministry of Agriculture, Government of India.

Domestic Markets Appear Poorly Integrated

Analysis of weekly arrival and wholesale price data for the five major markets for 2000-2003 indicates that India's apple market is poorly integrated (Deodhar, 2005b). There appears to be no strong relationship between price levels and fluctuations in the Delhi market—which handles about 70 percent of India's domestic apples—and prices in the other regional markets. Some market imperfections are to be expected given India's large size and stage of development, as well as the regional concentration of apple production. The degree to which the markets are not integrated is, however, somewhat surprising. In contrast to an efficient market, where spatial differences in prices primarily reflect transport and transaction costs, the spatial price variations in India are suggestive of weak market infrastructure and institutions, and a lack of competition between domestic suppliers.

Analysis of weekly wholesale price and domestic market arrival data for the major urban markets for 2000 and 2001 indicates that Delhi prices do not significantly affect prices elsewhere—that the other major markets are not well integrated with the Delhi market. And, except for Mumbai prices' affecting prices in Bangalore and Kolkata, none of the other markets are integrated. With widespread improvements in telecommunications in India, poor information flow across the markets is unlikely to be the cause of poor price linkages. More likely explanations include poor supply chain infrastructure for perishable commodities and the tendency of traders in more distant markets, such as Chennai, Bangalore, and Mumbai, to contract directly with growers and circumvent the Delhi market. Another factor may be the cascading effect of large trading margins that obscure price differences (see sections below on marketing costs and margins).

The lack of price integration between the Delhi market and the other major markets indicates the potential gains from investments in infrastructure and institutions that improve marketing efficiency. It also provides further evidence that the size of the domestic apple crop may not be a major factor in developing the markets for imported apples in the cities distant from Delhi.

Retail Prices of Domestic and Imported Apples

No published retail price data are available for domestic or imported apples. Based on data collected during market visits, retail prices of domestic Red Delicious and Royal Delicious apples range from an average of about Rs40 (US\$0.89) per kg during the period of peak arrivals to about Rs80 (\$1.78) for the better quality domestic apples during the lean summer season.

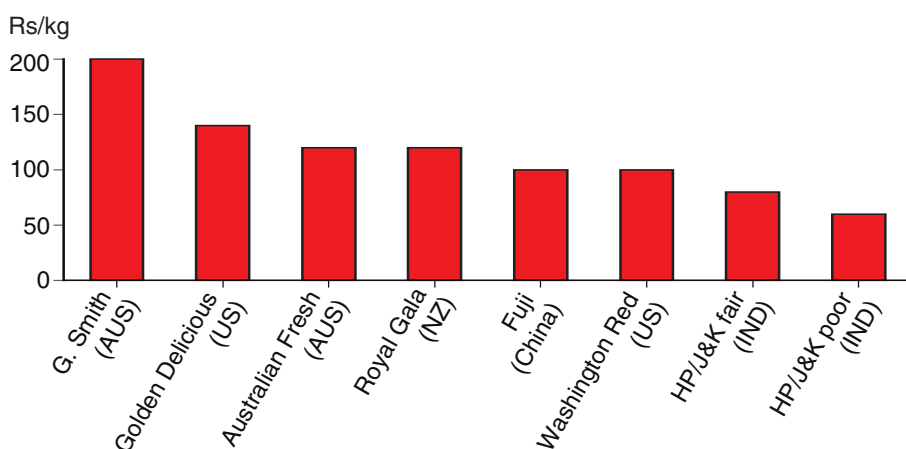
Domestic apples, which generally are not placed in cold storage, are sold in large and small cities and towns. Particularly in small towns, their quality and appearance are likely to be poor and prices relatively low.

Imported apples are most prevalent during March-July and are sold almost exclusively in upscale, upper middle-class market areas of larger cities, or in smaller towns or cities in the vicinity of large metropolitan areas. Generally, the major varieties of imported apples are Washington Red from the United States, Australian Fresh from Australia, Fuji from China, and Royal Gala from New Zealand.

Data collected from several shops in middle- and upper-class markets in Delhi in May 2003 are indicative of prices during the peak season for imported apples (fig. 14). During this period, Granny Smith apples from Australia—a specialty item imported by air—were the most expensive. Given the Indian consumer’s preference for apples that are red and sweet, these varieties dominate the availability of imported apples, and all typically sell within a narrow price range of Rs100-120 (\$2.22-\$2.67) per kg.

Typically, there is no retail packaging of either domestic or imported apples. Imported apples are readily distinguished from domestic apples by their size and uniformity of color and shape. U.S. Red Delicious and Australian apples are similar in color and size, and Indian consumers appear to prefer these varieties for their color and sweet taste. Although the Chinese Fuji varieties do not have the strong red color traditionally preferred by Indian consumers, they have become increasingly popular because of their sweetness and competitive pricing. Chinese Fuji apples are distinctive in markets because they come individually packed in styrofoam nets to prevent damage to the fruit.

Figure 14
Retail apple prices in Delhi (May 2003)



Note: HP = Himachal Pradesh. J&K = Jammu and Kashmir.
Source: ERS data.

Since the market for imported quality apples is in its infancy, the future success of the various suppliers and varieties remains an open question. Recent import growth suggests that retail demand among relatively high-income consumers for high-priced and high-quality imported apples is growing. A key question may be the extent to which improvements in productivity, quality, and post-harvest practices for domestic apples eventually provide competition with imports in middle-class and upscale markets.

Lack of Investment and Competition Boosts Marketing Costs and Margins for Domestic Apples

The difference between prices received by growers and those paid by consumers consists of marketing costs and marketing margins. Costs include packing, handling, transport, storage, losses, establishment costs, fees and taxes, and other charges involved in moving produce from farm to retail market. Marketing margins are the portion of the difference between grower and consumer prices not accounted for by marketing costs and include returns (or profits) to wholesalers, retailers, and other intermediaries in the supply chain, as well as unaccounted costs. Investments in supply chain infrastructure and competition among firms tend to reduce marketing costs and margins. But in emerging markets such as India, factors such as lack of investment and lack of competition may result in relatively high costs and margins.

Table 13—Marketing costs and margins for domestic apples in India, November 2003

Transaction	Cost/price ¹	
	<i>Rs/20 kg box</i>	
Net price received by grower		295.27
Expenses incurred by growers on:		118.07
Picking, grading, and packing	12.00	
Packing materials	45.00	
Carriage up to road-head	3.00	
Freight up to market	20.00	
Commission of forwarding agent	2.00	
Loading/unloading charges	3.00	
Commission of commission agent	33.07	
Realization at wholesale market ²		413.33
Expenses of wholesale trader		5.63
Carriage and handling	1.5	
Market fee	4.13	
Wholesale trader's margin ³		83.79
Sub-wholesaler purchase price		502.76
Sub-wholesaler margin ³		100.55
Retailer's purchase price		603.31
Retailer's expenses		65.33
Carriage and handling charges	5.00	
Produce wastage	60.33	
Retailer's margin ³		231.36
Consumer price ⁴		900.00

¹Estimates based on interviews with traders and market officials unless otherwise noted.

²National Horticulture Board, Ministry of Agriculture, Government of India.

³Margin estimates based on observable cost and price information and anecdotal information.

⁴Observed market price in Delhi, November 2003.

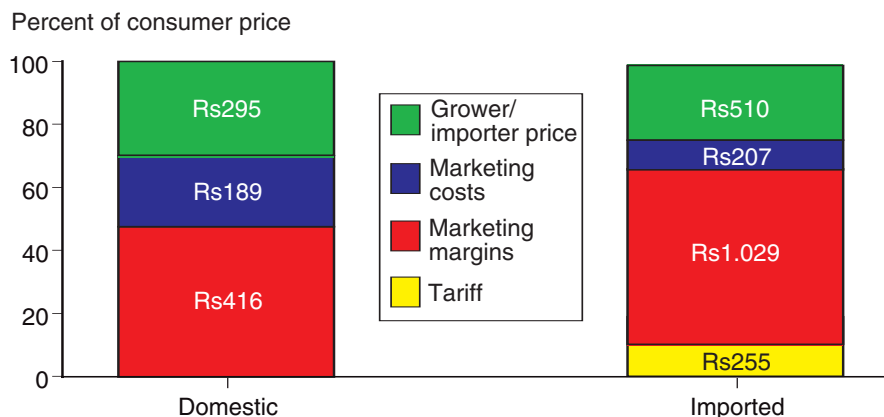
The prevailing marketing costs and margins in India's apple market were estimated for domestic apples from Himachal Pradesh sold through the New Delhi market during November 2003. Sources include reported market price data and information on costs and margins obtained through interviews with growers, contractors, wholesalers, and retailers (table 13). The average wholesale price is from published reports of the Azadpur market, and the average retail price is based on information from several Delhi retail markets. The grower price of apples is estimated as the wholesale price less costs of transportation, packaging, storage, agent commissions, etc. incurred in sales through the Azadpur market. Costs associated with wholesaling, sub-wholesaling, and retailing are averages based on interviews with intermediaries in the Delhi market.

The overall marketing margin in the supply chain is computed as the difference between the estimated grower price and the retail price, less the accounted marketing costs at all levels of the supply chain. The overall margin is then allocated to various agents—wholesaler, sub-wholesaler, and retailer—based on information collected during market visits. Average wholesaler and sub-wholesaler margins are estimated at about 20 percent of their costs, and the retailer margin is estimated at about 35 percent of costs. Although these allocations are somewhat arbitrary, the estimated overall margin accurately reflects market conditions in November 2003.

The results indicate that the margins—or profits and unaccounted costs—received by various agents in the supply chain accounted for the largest share of the difference between the producer and consumer price (fig. 15). The total marketing margin of Rs416 (\$9.24) per 20 kg box amounted to about 46 percent of the consumer price. By contrast, the grower price (Rs295/\$6.56 per 20 kg box) accounted for about 33 percent of the consumer price, and marketing costs (Rs189/\$4.20 per 20 kg box) accounted for about 21 percent of the consumer price.

The estimated grower share for Himachal Pradesh apples of 33 percent is somewhat higher than the estimated grower share of 20-25 percent for Red Delicious apples in the United States (Belrose, Inc., 2003). A lower share for U.S. growers likely reflects greater value addition in the U.S. supply

Figure 15
Marketing costs and margins for domestic and imported apples, India 2003



Prices are in Rs/20 kg box.
 Source: ERS estimates.

chain in terms of grading and packing, refrigerated transport, consumer friendly retail display, and retail packing. These types of value addition do not occur in India and, in this context, estimated Indian trading margins appear to be high. As produce moves further downstream in faraway markets, margins in the supply chain can have a cascading effect on prices.

Marketing Costs and Margins Are Higher for Imported Apples

Marketing costs and margins for imported apples are estimated in the same manner as for domestic apples, based on U.S. apples sold in the Delhi market during May 2003. For imported apples, both the import price and retail price are known from trade data and market sources, and the wholesale prices are imputed as residuals based on information collected on marketing costs and margins. As in the case of domestic apples, the allocation of marketing margins between importers, wholesalers, and retailers is based on anecdotal information and is somewhat arbitrary, but the aggregate margin reflects market conditions during May 2003.

For imported U.S. Red Delicious apples, trader margins—or profits and unaccounted costs—account for the largest share of the consumer price, just as with domestic apples (table 14). Trader margins account for a somewhat larger share of the consumer price of imported apples—about 51 percent—than for domestic apples (fig. 15). In absolute terms, trader margins on imported apples are estimated at Rs1,029 (\$22.87) per 20 kg box, or about two and half times larger than for domestic apples. The import price accounts for the next largest share of the consumer price—about 25 percent—while estimated marketing costs account for about 10 percent, and the import tariff about 13 percent. Marketing costs for imported apples are estimated to be low, primarily because the costs of value addition, including grading, waxing, better packaging, etc., are already included in the import price, and because traders report negligible losses in marketing imported apples.

Marketing margins account for the largest share of the consumer price of imported apples—about 51 percent. Given the current levels of efficiency and competition in the domestic marketing system, measures to reduce marketing margins could have a more substantial impact on retail prices and consumption of imported apples than actions to reduce import prices, tariffs, or marketing costs.

Several factors are likely contributing to the relatively large marketing margins for imported apples:

- *Lack of competition among importers.* Until now, only a limited number of importers have operated in the apple import trade. The Mumbai and Delhi markets each have about five principal importers, and Chennai has about three. Some earlier entrants have reportedly dropped out because of difficulties with logistics and marketing. With the concentration of the import trade, lack of competition may allow importers to extract high margins.

Table 14—Marketing costs and margins for imported apples in India, May 2003

Transaction	Cost/price ¹	
	<i>Rs/20 kg box</i>	
Import unit price, CIF		509.80
Expenses incurred by importer on:		434.00
Tariff	254.90	
Clearing	20.39	
Freight	70.00	
Commission of agent	88.71	
Importer's margin ³		165.17
Realization at wholesale market		1,108.97
Expenses of trader		22.59
Carriage/handling	1.50	
Cold storage (15 days on average)	10.00	
Market fee/commission	11.09	
Wholesale trader's margin ³		198.02
Sub-wholesaler's purchase price		1,329.58
Sub-wholesaler's margin ³		199.44
Retailer's purchase price		1,529.02
Retailer's expenses		5.00
Carriage and handling charges	5.00	
Produce wastage	0.00	
Retailer's margin ³		465.98
Consumer price ⁴		2,000.00

¹Estimates based on interviews with traders and market officials unless otherwise noted.

²Directorate General of Commercial Intelligence and Statistics, GOI.

³Margin estimates based on observable cost and price information and price information and anecdotal information.

⁴Observed market price in Delhi, May 2003.

- *Limited cold storage infrastructure.* Importers claim that limited availability of high-quality cold storage and refrigerated container capacity is restricting import volumes. High investment requirements for such infrastructure could pose a barrier to entry and contribute to the lack of competition. The significance of this factor is, however, unclear since repeated visits to the Azadpur market in Delhi indicated substantial unused capacity.
- *Lack of integrated supply chains.* As with domestic apples, the vast majority of fruit and vegetable wholesalers and retailers handling imported apples are small-scale independent operators. As a result, imported apples are exposed to the same inefficiencies as domestic apples.
- *Marketing risk faced by importers.* Apple importers face risks associated with the establishment and enforcement of import regulations, as well as price and foreign exchange risk in marketing imported apples, that are not included in our accounting of marketing costs. So far, however, no significant regulatory problems have occurred with apple import shipments, and large apparent trading margins provide ample protection against price and foreign exchange risk.

Recent investment activity by fruit traders, and by chain retailers in India, may eventually lead to improvements in marketing efficiency that benefit the import trade in apples. Several importers, including Garden Fresh, Yuppa, and Eurofruit, are reportedly investing in cold storage and transport infrastructure. Chain food retailing, though still accounting for a small fraction of total food sales, is beginning to expand due to investments by Indian companies, such as Big Bazaar, Food Bazaar, and Nilgiris. The Adani group of companies based in Ahmedabad, Gujarat have begun to establish ties with apple growers in Himachal Pradesh to introduce new apple varieties and post-harvest handling practices to meet the needs of their expanding food retailing business.

Although foreign direct investment in retailing is not permitted, foreign companies, including Giant (Singapore), Shoprite (South Africa), and Metro AG (Germany) are also beginning to invest through Indian partners and franchisees. These developments are likely to provide increasing opportunities to integrate supply chains and reduce costs and margins for imported apples and other foods.

Apple Import Projections

India's rising demand for imported apples has been driven by rising incomes and the removal of quantitative import restrictions. Indian consumers are also responsive to prices when purchasing apples and other food items, and the relatively high price of imported apples has been due to the large marketing margins for imported apples, as well as the 50-percent import tariff. To a large extent, India's future imports of apples are likely to be shaped by the continued strong growth of per capita incomes, possible changes in import tariffs, and improvements in marketing efficiency stemming from increased integration, competition, and investment in the supply chain.

To analyze the potential impacts of income growth, tariff reductions, and increased marketing efficiency on India's future apple imports, imports are projected over 10 years under 4 scenarios:¹⁰

- *Status quo.* Annual income growth of 6 percent (4.5 percent per capita), with a 50-percent tariff, and constant marketing margins and costs for imported apples.
- *Reduced tariff.* Same as #1, but with the tariff reduced from 50 percent to 25 percent.
- *Reduced marketing margin.* Same as #1, but with the absolute size of the marketing margin reduced to the same size as the margin on domestic apples.
- *Reduced tariff and marketing margin.* Both the tariff and marketing margin are reduced. A combination of #2 and #3.

The status quo scenario results indicate that income growth boosts apple imports about 9 percent annually from an average of 19,330 tons during 2002-2003 to 45,800 tons after 10 years in 2013 (table 15). Cutting the apple import tariff in half (reduced tariff scenario) leads to an increase in annual import growth to 9.6 percent, raising imports to 48,400 tons per year by 2013. A reduction in the marketing margins on imported apples to the level observed for domestic apples (margin reduction scenario) boosts

¹⁰The projections assume a base level of imports equivalent to average actual imports for 2002-2004 (19,330 tons), and that the import price of apples remains constant in real terms during the projection period. The income elasticity of demand for imported apples is assumed to be 1.50, and the own price elasticity of demand for imported apples to be -1.00. Because imported apples are a relatively high-priced luxury good, it is assumed that the income and price elasticities of demand are higher than those estimated for domestic apples.

Table 15—Scenario projections for Indian apple imports, 2013¹

Scenario	Unit	Status quo	Tariff reduction	Margin reduction	Tariff & margin reduction
Annual income growth	Percent	6.0	6.0	6.0	6.0
Import tariff	Percent	50.0	25.0	50.0	25.0
Trader margins ²	Percent	51.0	51.0	21.0	21.0
Imports (2013)	1,000 metric tons	45.8	48.4	58.6	61.3
Annual growth rate	Percent	9.0	9.6	11.7	12.2

¹Scenario projections for 2013 based on 2002-2004 average calendar year imports of 19,330 metric tons.

²Percent of consumer price. In margin reduction scenarios, the rupee value of trader margins for imported apples is set equal to the margin on domestic apples.

annual import growth to 11.7 percent, and annual imports rise to 58,600 tons, 28 percent higher than in the status quo scenario, by 2013. The combination of continued high income growth and reductions in both tariffs and margins boosts annual growth in imports to 12.2 percent and annual imports to 61,300 tons by 2013.

All the scenarios assume that apple imports are not affected by enforcement of food waxing regulations or other phytosanitary or nontariff measures. The projections also assume that investments to improve the quality and competitiveness of domestic apples remain insignificant.

Conclusions

India's emergence as an export market for apples since 1999 has been driven by growth in per capita incomes and the removal of quantitative import restrictions. A small but expanding segment of upper middle class consumers now have sufficient income to diversify and upgrade their diets by purchasing high-priced and high-quality products, such as imported apples. However, the high cost of domestic and, particularly, imported apples compared with other Indian fruit is likely to restrict consumption of apples by middle- and lower-income consumers who make up most of India's population.

The extent to which domestic apple producers will be able to boost productivity and quality are key uncertainties in evaluating the prospects for the Indian apple market. Low productivity compared with most other domestic fruit—as well as other apple-producing countries—raises apple prices relative to substitute foods and limits growth in domestic apple consumption. It is unclear if the production constraints imposed by terrain and climate can and will be overcome by the introduction of improved varieties and cultivation practices. The poor quality of domestic apples is also due to poor grading, packing, refrigeration, and transport practices. So far, there is little evidence that the influx of high-quality and high-priced imported apples is leading Indian growers and traders to invest in improved production or post-harvest practices.

The advent of apple imports has been controversial among Indian agricultural policy stakeholders because of concern with impacts on domestic producers. The 50-percent tariff on apples is the highest of all Indian fruit, and the highest among all major apple producing and consuming countries with the exception of Turkey. The evidence indicates, however, that the high tariff affords little or no protection to domestic apple producers, who generally receive a price below the world price. Imported apples do not compete with domestic apples as close substitutes because of the sharply higher price and quality of imports. The only exception is during the peak harvest period, when domestic apples still have the crispness and sweetness that imported apples have year round. Because of the large gap in price and quality, the presence of imported apples seems to have provided an opportunity for domestic intermediaries to earn greater profits with little impact on domestic growers. For the most part, domestic growers have yet to exploit the opportunity to boost their earnings by improving quality to compete with imported apples.

Nontariff import regulations, including phytosanitary requirements and pesticide residue and food safety rules, are potential barriers to Indian apple imports. Some Indian requirements, such as those pertaining to waxing and chemical residues, differ from U.S. and international standards. Although these regulations have not led to any significant disruption of apple trade so far, future changes in rules or enforcement could prove disruptive.

Marketing margins—or returns to importers, wholesalers, and retailers over and above their costs—account for the largest share of consumer apple prices in India. High margins are a key factor behind high retail prices for

domestic and, particularly, imported apples. India's high marketing margins and costs are associated with an array of factors common to emerging markets. These include lack of competition among importers and other agents in the marketing system, lack of integration and investment in the supply chain, and risk and uncertainty, particularly regarding enforcement of import regulations. There appears to be significant scope for improvements in marketing efficiency that would provide lower prices to consumers, and also allow producers to receive a larger share of the retail price.

Strong income growth in India is projected to lead to continued expansion of apple imports. A key finding of this analysis is that efforts to reduce the margins—or profits and unaccounted costs—received by importers, wholesalers, and retailers in the marketing of imported apples are likely to have a greater impact on imports than efforts to reduce import prices, the tariff, or marketing costs. Also, weak market integration and poor storage, handling, and transport infrastructure, suggest that imported apples can compete most effectively in markets distant from Delhi, such as Chennai, Bangalore, and Mumbai, particularly if retail prices can be reduced.

U.S. apples have been highly competitive in the Indian market on the basis of both price and quality characteristics, earning the largest share of the market during 1999-2004. China—the world's largest apple producer—has, however, emerged as a major competitor. Although China's Fuji apples lack the deep red color favored by Indian consumers, they compete successfully on the basis of price and taste. Just as progress in improving marketing efficiency and reducing retail prices is likely to be a key to future growth in apple consumption, price competitiveness is likely to be a key determinant of future shares of India's apple imports.

References

- Agriculture Produce Marketing Committee (2002). "Brief Note: 25 Years of Glorious Service." Azadpur, Delhi.
- Belrose, Inc. (2003). "World Apple Review." Pullman, WA.
- Comptroller and Auditor General of India (2004). *Audit Report (Civil), Himachal Pradesh for the Year 2003/04*. <http://cag.nic.in/>
- Central Board of Excise and Customs (2005). *Customs Tariff Act 2005*. http://www.cbec.gov.in/cae/customs/cs-tariff/cus-tariff-2005/cst_schedule_1.htm
- Deodhar, Satish Y. (2005a). "Trade Cost, Trade Policy and Trade Volume: A Study of Indian Apple Market." Working Paper No. 2005-08-01, Indian Institute of Management/Ahmedabad, August 2005. Available at: <http://www.iimahd.ernet.in/publications/data/2005-08-01satish.pdf>
- Deodhar, Satish Y. (2005b). "What's Keeping the Apples Away? Addressing the Market Integration Issue." Working Paper No. 2005-08-03, Indian Institute of Management/Ahmedabad, August 2005. Available at: <http://www.iimahd.ernet.in/publications/data/2005-08-03satish.pdf>
- Devadoss, S., and T. Wahl (2004). "Welfare Impacts of Indian Apple Trade Policies." *Applied Economics 2004*, Volume 36 Number 12.
- Directorate General of Commercial Intelligence and Statistics (1998-2001). "Monthly Statistics of Foreign Trade of India." Kolkata.
- Dubey A.K., N. Rai and D. S. Yadav (2001). "Harnessing of Fruit Potential for Prosperity in Arunachal Pradesh." ENVIS Bulletin: Himalayan Ecology & Development, Volume 9, No. 20.
- ESRI, Redlands, CA.
- Food and Agriculture Organisation (2005). Agriculture Data: FAOSTAT. [http://apps.fao.org/faostat/form?collection=Production.Crops.Primary&Dmain=Production&servlet=1&hasbulk=0&version=ext&language=EN](http://apps.fao.org/faostat/form?collection=Production.Crops.Primary&Domain=Production&servlet=1&hasbulk=0&version=ext&language=EN)
- ____ (2005). <http://faostat.org/faostat/collections?subset=FwdQuality>
- Ghosh, S. P. (2000). "Deciduous Fruit in India." *Apple Journal*, Pearl Street Design, Inc., Eastport, USA. <http://www.applejournal.com/india001.htm>
- Global Trade Information Services, Inc. 2005. World Trade Atlas.
- Goldammer, T. (2001). "A Passage to the Indian Market Could Start With Horticultural Products," Country Profile, Horticultural and Tropical Products Division, FAS/USDA, Washington, DC. <http://www.fas.usda.gov/htp/highlights/2001/india.pdf>
- Government of India, Central Board of Excise and Customs.
- Government of India, Ministry of Finance. *Economic Survey*, various issues.
- Gupta, G.S. (2001). *Macroeconomics Theory and Applications*, Tata McGraw-Hill, New Delhi.

- Hindu Business Line (2005). "Apple growers bring in global practices." June 24, 2005. <http://www.thehindubusinessline.com/2005/06/24/stories/2005062400501000.htm>
- Krissoff, B., L. Calvin, and D. Gray (1997). "Barriers to Trade in Global Apple Markets," *Fruit and Tree Nut Situation and Outlook*, FTS-280, Economic Research Service, U.S. Department of Agriculture, August.
- Kumar, P. (1998). "Food Demand and Supply Projections for India," Agricultural Economics Policy Paper 98-01, Indian Agricultural Research Institute, New Delhi.
- Mehta, R. S. (2003). "It all began with an apple." *Jetwings* (A monthly magazine of Jet Airways, India), Issue 2, February, 108-115.
- Ministry of Health and Family Welfare (2005). *Prevention of Food Adulteration*. <http://www.mohfw.nic.in/pfa.htm>.
- National Horticulture Board, Ministry of Agriculture, Government of India (1997). "Facts & Figures (Indian Fruit & Vegetables)."
- ____ (2000). "Operational Guidelines (Cold Storage & other Schemes)."
- ____ (2000–2003). "Horticulture Information Service (Monthly)."
- National Sample Survey Organization (2000). *Household Consumer Expenditure in India, 1999-2000*. Ministry of Statistics and Program Implementation, Government of India, December. Available online at: http://mospi.nic.in/stat_act_t14.htm
- Northwest Horticulture Council (2005), "Tariff Rate Barriers." <http://nwhort.org/TariffRateBarriers.html>
- ____ (2005). "U.S. Maximum Residue Levels." <http://nwhort.org/USAMRLTemplate.html>
- Pingali, P., and Y. Khwaja (2004). "Globalisation of Indian Diets and the Transformation of Food Supply Systems." ESA Working Paper 05-04, Food and Agriculture Organization, March.
- Radhakrishna, R., and K. N. Murty (1997). "Econometrics of Complete Demand Systems with Illustrations from India." in K.L. Krishna (ed.), *Econometric Applications in India*. Oxford University Press, New Delhi, pp. 147-237.
- Sikka, B.K., and K. C. Azad (1991). "Consumption Pattern and Demand Projections for Fresh Fruit in India." *Acta Horticulturae*. 270:231-236. http://www.actahort.org/books/270/270_27.htm
- U.S. Department of Agriculture, Foreign Agricultural Service (2003). "World Apple Situation: Acreage Continues to Decrease in Major Producing and Trading Countries." Horticultural & Tropical Products Division, March.