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An Overview of Global Papaya Production, Trade, and Consumption[1]

Edward A. Evans and Fredy H. Ballen[2]

Introduction

The market demand for tropical fruits has been growing steadily over the past two decades. Global production of tropical fruits (excluding bananas) reached 73.02 million (M) metric tonnes (t) in 2010. Gaining in popularity worldwide, papaya is now ranked third with 11.22 Mt, or 15.36 percent of the total tropical fruit production, behind mango with 38.6 Mt (52.86%) and pineapple with 19.41 Mt (26.58%). Global papaya production has grown significantly over the last few years, mainly as a result of increased production in India. Papaya has become an important agricultural export for developing countries, where export revenues of the fruit provide a livelihood for thousands of people, especially in Asia and Latin America. Papaya exports contribute to the growing supply of healthy food products on international markets. The top three exporting countries accounted for 63.28 percent of the total global exports of papaya between 2007 and 2009, with more than half of those exports going to the United States.

The objective of this article is to provide information on global trends in the production and trade of papaya. An overview of the current and future trends of global papaya production and trade, and the main papaya exporting and importing countries is presented herewith.

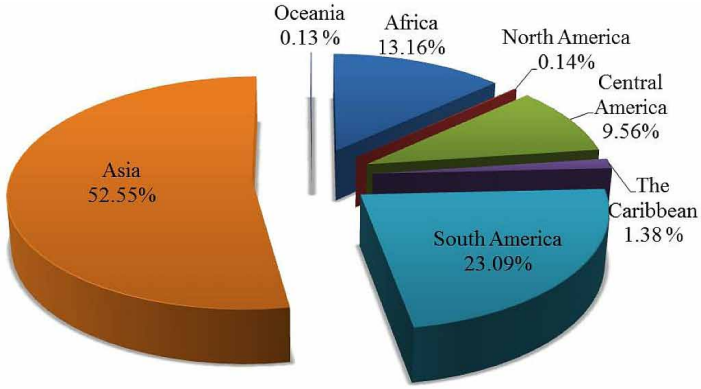

Figure 1. Papaya production by geographic area, 2008–2010. Source: FAOSTAT (2012a).

Global Production of Papaya

Papaya is considered one of the most important fruits because it is a rich source of antioxidant nutrients (e.g., carotenes, vitamin C, and flavonoids), the B vitamins (e.g., folate and pantothenic acid), minerals (e.g., potassium and magnesium), and fiber. In addition, papaya is a source of the digestive enzyme papain, which is used as an industrial ingredient in brewing, meat tenderizing, pharmaceuticals, beauty products, and cosmetics.

Papayas are produced in about 60 countries, with the bulk of production occurring in developing economies. Global papaya production in 2010 was estimated at 11.22 Mt, growing at an annual rate of 4.35 percent between 2002 and 2010 (global production in 2010 was 7.26%

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2. Edward A. Evans, associate professor, and Fredy H. Ballen, economic analysis coordinator II, University of Florida, Tropical Research and Education Center, Homestead, FL.

higher than 2009, and 34.82% higher than 2002). Asia has been the leading papaya producing region, accounting for 52.55 percent of the global production between 2008 and 2010, followed by South America (23.09%), Africa (13.16%), Central America (9.56%), the Caribbean (1.38%), North America (0.14%), and Oceania (0.13%) (**Figure 1**) (FAOSTAT 2012a). There are two main types of papayas produced: the small-sized Solo-type papayas (aka Hawaiian papayas), usually weighing between 1.1 and 2.2 pounds per unit, and the large-sized papayas (aka Mexican papayas), weighing up to 10.0 pounds per unit.

Table 1 shows the leading global papaya producing countries for period 2002–2010. As shown in **Table 1**, global papaya production is highly concentrated, with the top ten countries averaging 86.32 percent of the total production for the period 2008–2010. India is the leading papaya producer, with a 38.61 percent share of the world production during 2008–2010, followed by Brazil (17.5%) and Indonesia (6.89%). Other important papaya producing countries and their share of global production include Nigeria (6.79%), Mexico (6.18%), Ethiopia (2.34%), Democratic Republic of the Congo (2.12%), Colombia (2.08%), Thailand (1.95%), and Guatemala (1.85%). While papaya production has remained relatively flat for most of the major producers, production in India has increased significantly within the last few years, and is chiefly responsible for the noticeable growth in global papaya production. From just over 2 Mt in 2005, papaya production in India more than doubled to 4.7 Mt in 2010, representing an impressive annual growth rate of 14.94 percent. The biggest increase in global papaya production occurred between 2009 and 2010, as production in India increased by 20.50 percent. Such an impressive growth in production was due to a combination of increased acreage planted, improved genetics, and better management.

The global papaya industry faces two major problems: the papaya ringspot virus (PRSV), a disease that drastically reduces fruit yield, fruit size and quality, and in some cases results in total loss of production. PRSV, whose pathogenic agent is carried out by an aphid, has wiped out entire papaya plantations in several countries. PRSV has severely limited the world expansion of papaya production; for example, because of this disease, papaya production in Hawaii almost disappeared in the 1990s. Efforts to save the Hawaiian papaya industry led to the development of two genetically modified (GM) papaya cultivars, Sun Up and Rainbow, which were released to the general public in 1998. Later, in August 2006, another GM papaya cultivar, Huanong 1, was approved for commercialization and released to the public in China. The cultivar Huanong 1 is only available through a Chinese seed company in the form of micro-propagated seedlings. Countries such as Jamaica, Taiwan, and Thailand have also completed successful field testing of PSRV-resistant GM cultivars but are still awaiting commercialization. Australia, the Philippines, Malaysia, and Vietnam are still in the field-trial phase (Mendoza, Laurena, and Botella 2008). After a successful variety is developed, issues related to public perception, regulatory procedures, and intellectual property rights lengthen the time to release and commercialize a GM variety.

The second major problem faced by the global papaya industry is significant post-harvest losses along the marketing chain. Factors such as fungal diseases, physiological disorders, mechanical damage, or a combination of these are the leading causes of post-harvest losses. While papaya has suffered post-harvest losses ranging from 30 to 60 percent in the Southeast Asia region (FAO 2006), simple technology and practices have helped to reduce losses and to extend storage life. The major post-harvest constraint, however, is infrastructure development, with challenges such as needed improvements in road access to the producing regions and insufficient electricity supply when demand continues to grow also being of concern for this industry and its stakeholders.

Trends in Global Exports of Papaya

Global papaya exports exhibited an upward trend over the period 2002 to 2009, although growth was somewhat erratic. Total exports in 2009 were estimated at 268,476 metric tonnes (t), a 31.5 percent rise over the volume exported in 2002, with an estimated value of about $197.2 million (FAOSTAT 2012b). Although the quantity traded internationally has been increasing, it still represents only a small share, as less than 3 percent of the global production is exported. **Table 2** shows the top ten papaya exporting countries. As can be seen in **Table 2**, three countries—Mexico, Brazil, and Belize—dominate the papaya export market. Together they accounted for 63.28 percent of the global trade between 2007 and 2009. During that period, Mexico was the leading papaya exporter, representing about 41 percent of the trade, while Brazil and Belize accounted for about 11 percent each of the trade. Other major papaya exporting countries include Malaysia, India, and the United States (mainly via re-exports). In the case of India, despite being the world leading papaya producer, exports of the fruit in 2009 were less than 1 percent of the total production. India domestic demand for papaya has been strong because of a sizable population, a significant rise on per-capita income, and a growing interest for healthier

food products (The Hindu Business Line 2011). The rise in global papaya exports was particularly strong in 2009, as shipments from Mexico increased markedly from 90,316 t in 2008 to 134,960 t in 2009.

Mexico

As mentioned earlier, Mexico is the leading exporter of papaya. The main papaya cultivars grown in Mexico are Maradol and Red. Minor cultivars include Yellow Hawaiian and Criolla. The main papaya plantations are located in the southeastern area of the country in the states of Veracruz, Chiapas, Oaxaca, Michoacan, Tabasco, and Yucatan; these states account for more than 80 percent of the total Mexican production. Looking at the period 2006 and 2010, papaya production fell precipitously by 29.59 percent, and harvested area declined by 5,211 hectares (ha), or 36.74 percent (**Table 3**). Higher production costs, restricted access to capital, and pests and diseases have been cited as the chief factors leading to the decline in production. On the positive side, there has been some gain in productivity. Compared with 2006, average yield in 2010 rose by 2.2 t/ha. It is apposite to note that even though domestic production of the fruit has trended downward, fruit exports have trended upward. Exports have increased from 93,396 t in 2006 to 122,773 t in 2010, reflecting an annual growth rate of about 7.86 percent. For the year 2010, about 20 percent of the total Mexican papaya production, valued at about $44.4 million, was sold to the international markets (SIAP 2012). The bulk of exports from Mexico is shipped to US and Canadian markets.

Brazil

Brazil is the second largest papaya exporter, with its largest plantations located in the state of Espírito Santo and in the northeastern area of the country. The climate of these regions makes it possible to produce and export papaya year-round. The main papaya cultivars grown in Brazil are the Golden and Formosa. Between 2006 and 2010, domestic papaya production decreased by 1.40 percent, or 26,340 t, reflecting a 2,293 hectare (ha) decline in harvested area (**Table 4**). The decline in harvested area was somewhat offset by a rise in productivity. Average yield increased 2.7 t/ha between 2006 and 2010. The domestic market for papaya is important in Brazil, where less than 2 percent of Brazilian papaya production is sold on the international markets at an estimated value of about $35 million (IBRAF 2012a, 2012b). Because of the importance of its domestic market for papaya, the Brazilian Agricultural Research Corporation (EMBRAPA) has collaborated with the developers of the Hawaiian GM papaya to develop a Brazilian GM variety resistant to the PRSV (Mendoza, Laurena, and Botella 2008).

Belize

Belize overtook Malaysia in 2007 to become the third largest papaya exporter. The main papaya growing region in Belize is the Orange Walk District located in the northwestern area of the country. Belize produces the small-sized Solo-type (Sunrise, Kapoho, and Tokita Sunrise) and large-sized type (Princess Scarlet, Maradol Rojo, and Tainung II) papaya cultivars. The decline in production between 2006 and 2010, from 34,500 t to 25,100 t, or 37.45 percent (**Table 5**), is due in large part to the destruction caused by Hurricane Dean in 2007. Unlike most of the other leading exporters, only a small portion of the Belizean crop, less than 1 percent, is consumed locally. Papaya ranks third behind citrus and sugarcane in Belizean crop exports. In 2010, its papaya exports were estimated to be about $12.6 million (SIB 2012; UN Comtrade 2012).

Trends in Global Imports of Papaya

Table 6 shows the top ten papaya importing countries. As can be seen in **Table 6**, international demand for the fruit is highly concentrated, with the United States being the largest importer of fresh papaya, accounting on average for 54.60 percent of the global papaya imports between 2007 and 2009. Other top importers of papaya and their respective shares of the total imports are Singapore (8.34%), Canada (5.30%), the Netherlands (4.18% as re-exports), the United Kingdom (3.29%), Germany (3.25%), Hong Kong (3.06%), Spain (2.46%), Portugal (2.36%), and El Salvador (2.33%), respectively.

As the largest papaya importer, papaya imports to the United States have grown at an annual rate of 10.94 percent, from 88,559 t in 2002 to 156,430 t in 2009. The three main papaya exporters to the US market and their share of the export value in 2009 were Mexico ($72.82 million, 74.51%), Belize ($14.36 million, 14.69%), and Brazil ($6.30 million, 6.44%); together these three countries accounted for 95.55 percent of the US papaya import market that year (UN Comtrade 2012).

Although Singapore is the second largest papaya importer, papaya imports to Singapore declined 17.91 percent between 2002 and 2009, after peaking in 2003 at about 27,536 t. The main papaya exporters to the Singapore market and their share of the export value were Malaysia ($4.77 million, 90.31%), the Philippines ($0.35 million, 6.80%),

and Thailand ($0.11 million, 2.12%); together these three countries accounted for 99.23 percent of the Singapore papaya import market that year (UN Comtrade 2012).

Canada is the third largest papaya importer. Canadian imports of the fruit increased more than twofold, from 5,624 t in 2002 to 13,230t in 2009. The main papaya exporters to the Canadian market and their share of the export value during 2009 were the United States ($4.25 million, 27.41%), Belize ($3.74 million, 24.32%), and Mexico ($3.04 million, 19.70%); together these three countries accounted for 71.43 percent of the Canadian papaya import market that year (UN Comtrade 2012). In 2003, Canada became the first country to approve the import of GM papayas from Hawaii after their nutritional composition, toxicological implications, and allergenic potential were carefully examined by the Canadian regulatory authorities.

Concluding Remarks

Recent gains in global papaya production are mainly the result of India's significant increase in harvested area and fruit yield; it remains to be seen how much India will expand papaya cultivation in the coming years. Papaya production from the other top producing countries is expected to grow based on domestic consumption of the fruit and prices in international markets.

Global papaya exports are expected to slow down in the near future because the upward trend in fruit yield has not completely offset the downward trend in harvested area. In contrast, domestic consumption in the main export markets is expected to rise due to stronger economic conditions and less stringent quality requirements.

The mainstream commercialization of GM papaya in domestic and international markets is just a matter of time. Several countries have already developed GM papaya cultivars and are working on regulatory issues to release the new PRSV resistant cultivars, while other countries are still in the field testing stage of new PRSV-resistant GM papaya cultivars. The public release and commercialization of these new cultivars will have to overcome barriers such as regulatory procedures, intellectual property rights, and consumer perception.

The United States is currently the largest papaya importer because of its high per-capita income, and sizable Asian and Hispanic populations. Additional promotional efforts on the health and nutritional benefits of papaya consumption are needed to increase consumption of the fruit among the US white- and African-American populations.

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Table 1. Global papaya production, 2002–2010 (metric tonnes [t])

Countries	2002	2003	2004	2005	2006	2007	2008	2009	2010	% 2008–10
India	2,147,200	1,692,100	2,535,100	2,139,300	2,482,100	2,909,000	3,629,000	3,911,600	4,713,800	38.61
Brazil	1,597,700	1,714,590	1,612,350	1,573,820	1,897,640	1,811,540	1,890,290	1,792,590	1,871,300	17.50
Indonesia	605,194	626,745	732,611	548,657	643,451	621,524	717,899	772,844	695,214	6.89
Nigeria	755,000	803,275	859,359	755,500	759,000	765,000	688,782	763,619	703,800	6.79
Mexico	876,150	955,694	787,663	709,477	798,589	919,425	638,237	707,347	616,215	6.18
Ethiopia	226,000	230,540	260,000	302,356	259,174	230,000	250,000	260,000	232,400	2.34
Democratic Republic of the Congo	210,305	212,180	214,070	215,980	217,900	219,840	221,800	223,777	225,772	2.12
Colombia	86,912	91,608	103,870	140,346	164,606	223,945	207,698	189,007	263,178	2.08
Thailand	351,693	309,003	277,923	30,961	134,443	195,377	201,099	206,762	211,594	1.95
Guatemala	54,000	69,000	84,000	99,000	113,277	184,530	190,000	196,615	200,000	1.85
Other	1,414,096	1,463,246	1,387,263	1,494,193	1,432,796	1,369,688	1,413,564	1,439,622	1,489,758	13.68
TOTAL	**8,324,250**	**8,167,981**	**8,854,209**	**8,009,590**	**8,902,976**	**9,449,869**	**10,048,369**	**10,463,783**	**11,223,031**	**100.00**

Source: FAOSTAT (2012a, 2012b).

Table 2. Global papaya exports, 2002–2009 (metric tonnes [t])

Countries	2002	2003	2004	2005	2006	2007	2008	2009	% 2007–09
Mexico	68,558	74,814	96,525	83,159	94,891	101,306	90,316	134,960	40.9
Brazil	28,541	39,492	35,930	38,757	32,475	32,267	29,968	27,554	11.2
Belize	11,307	16,886	28,751	28,635	34,475	33,341	28,967	27,152	11.2
Malaysia	60,892	71,473	58,149	42,008	50,545	26,938	24,168	24,301	9.4
India	3,452	3,550	3,475	6,434	10,344	10,880	13,834	17,573	5.3
United States	7,106	7,046	9,789	10,704	3,586	9,604	9,031	8,090	3.3
Netherlands	3,362	10,548	9,554	9,402	9,392	8,625	7,596	8,023	3.0
Guatemala	2,475	1,750	1,069	3,915	3,638	6,680	9,794	7,375	3.0
Ecuador	1,976	4,477	7,196	5,373	5,549	5,486	4,372	5,370	1.9
Belgium	655	295	980	793	731	527	593	2,496	0.5
Others	24,352	23,327	25,449	24,884	25,373	40,103	25,193	16,790	10.3
TOTAL	**212,676**	**253,658**	**276,867**	**254,064**	**270,999**	**275,757**	**243,832**	**279,684**	**100.0**

Source: FAOSTAT (2012a, 2012b).

Table 3. Mexico: Papaya production and exports, 2006–2010

Year	Area Harvested (hectares)	Yield (t/ha)	Production (t)	Exports (t)
2006	19,391	41.2	798,589	93,396
2007	20,946	43.8	919,425	97,889
2008	16,084	39.6	638,237	89,208
2009	15,574	45.4	707,347	134,086
2010	14,180	43.4	616,215	122,773

Source: SIAP (2012); FAOSTAT (2012a, 2012b).

Table 4. Brazil: Papaya production and exports, 2006–2010

Year	Area Harvested (hectares)	Yield (t/ha)	Production (t/ha)	Exports (t/ha)
2006	36,650	51.7	1,897,640	32,759
2007	34,774	52	1,811,540	32,266
2008	36,585	51.6	1,890,290	29,968
2009	34,213	52.3	1,792,590	27,557
2010	34,357	54.4	1,871,300	27,057

Source: IBRAF (2012b); FAOSTAT (2012a, 2012b).

Table 5. Belize: Papaya production and exports, 2006–2010

Year	Area Harvested (hectares)	Yield (t/ha)	Production (t)	Exports (t)
2006	530	65	34,500	34,474
2007	520	64.8	33,731	33,341
2008	428	63	26,978	26,708*
2009	273	90.3	24,653	24,406*
2010	280	89.6	25,100	24,849*

*Decline due to Hurricane Dean in 2007.
Source: SIB (2012); FAOSTAT (2012a, 2012b).

Table 6. Global papaya imports, 2002–2009 (metric tonnes [t])

Countries	2002	2003	2004	2005	2006	2007	2008	2009	% 2007–09
United States	88,559	101,868	126,024	116,045	132,175	138,115	124,330	156,430	54.6
Singapore	25,574	27,536	24,606	25,788	25,546	19,086	23,181	21,689	8.3
Canada	5,624	6,039	10,324	11,694	12,054	14,487	12,950	13,230	5.3
Netherlands	8,157	14,905	15,432	17,717	14,190	12,569	10,845	8,623	4.2
United Kingdom	8,031	11,406	11,108	10,311	9,312	8,588	8,335	8,282	3.3
Germany	5,965	9,140	10,581	10,980	7,223	8,155	8,516	8,233	3.2
Hong Kong	24,991	28,649	25,972	21,688	17,262	9,800	8,306	5,381	3.1
Spain	1,312	2,543	3,541	3,593	4,782	6,686	6,802	5,386	2.5
Portugal	3,943	5,316	5,682	5,727	5,548	5,992	5,912	6,209	2.4
El Salvador	2,360	2,028	1,989	3,217	3,574	5,080	5,751	7,070	2.3
Others	23,367	24,870	30,081	27,416	31,778	25,613	29,655	27,943	10.8
TOTAL	**197,883**	**234,300**	**265,340**	**254,176**	**263,444**	**254,171**	**244,583**	**268,476**	**100.0**

Source: FAOSTAT (2012b).