

# Papaya

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Department of Agricultural and Resource Economics  
College of Tropical Agriculture and Human Resources  
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By

Trace V. Tipton, Kevin M. Yokoyama,  
Kulavit Wanitprapha, Stuart T. Nakamoto, and C. L. Chia



## CROP PROFILE

### VARIETIES

- Papaya, *Carica papaya* L., is a quick-growing, hollow-stemmed, perennial native to tropical America. It is widely distributed, and its fruit is consumed throughout most tropical and subtropical regions.
- There are many different papaya cultivars, but few pure strains exist due to the dioecious nature of the plant. Some papaya fruits are only a few inches long, while others are as long as 1 foot and weigh almost 20 pounds.
- The Hawaii papaya industry is based on the 'Solo' variety, which was developed in Hawaii from seed introduced from Barbados. Among important 'Solo'-type varieties in Hawaii are 'Kapoho', 'Sunrise', and 'Waimanalo'.
- The yellow-orange-fleshed 'Kapoho' is the most widely grown variety in Hawaii. It is adapted to the Puna district on the Big Island and has fruits that weigh 12 to 22 oz. The reddish-orange-fleshed 'Sunrise' variety has larger fruits than 'Kapoho' and is grown commercially on Kauai. 'Sunrise' is the major exported papaya cultivar in the world and is grown primarily in Brazil and tropical Africa. The 'Waimanalo' variety is grown on Oahu; its yellow-orange-fleshed fruits are larger than other 'Solo' varieties.

### PRODUCTIVITY

- Papaya can be harvested nine to 14 months after planting. The trees eventually may reach a height of 30 feet. Commercial orchards normally are replanted after three to four years

because yields decline and disease problems increase as the tree ages. Harvesting is more difficult with taller trees.

- Papaya is mainly propagated by seed. Vegetative propagation, including tissue culture, is possible but is relatively expensive.
- The papaya plant will not tolerate frost and is grown best at altitudes of less than 500 feet above sea level. Papaya requires well-drained, fertile soil; waterlogged soil encourages many diseases affecting papaya. An ideal pH is 6.0 to 7.0, and annual rainfall of 40 to 60 inches is sufficient.
- The yield of papaya is normally highest during the first year of production. The average yield of papaya in Hawaii during 1989 was 29,600 lb/ac.
- When papaya plants are short, fruits can be harvested by hand while one is standing on the ground. As the plants grow taller, harvesting aids are required. One technique uses a modified plumber's helper to snap the papaya from the stem, catching it before it falls to the ground. One person can harvest about 800 to 1000 pounds per day using this technique. Another technique involves a platform rigged to a tractor, which lifts the workers. This method is limited to flat terrain.
- The maximum postharvest life of fresh papaya is approximately 28 days when stored under optimum conditions. Partially ripe papaya can be stored for two weeks at 50°F. A cooler temperature may prevent the fruit from ripening.
- Papaya diseases are a serious problem in Hawaii. Among the major diseases are anthracnose and

chocolate spot, papaya ringspot virus, and phytophthora. Aphids, fruit flies, and mites are some of the pests that affect papaya.

- The papaya commodity fact sheet PA-3(A), published by the Hawaii Institute of Tropical Agriculture and Human Resources, provides additional horticultural information on papaya.

### USES AND PRODUCTS

- Ripe papaya is consumed fresh; it can also be processed and used in a variety of products such as jams, fruit juices, and ice cream. Papaya is also consumed as dried fruit. Culled fruits can be fed to pigs and cattle.
- Papaya is an ingredient in a variety of cuisines throughout the world. Unripe fruits and leaves are consumed as vegetables. Papaya seeds are also used as an ingredient in salad dressings.
- Papain is a milky latex collected by making incisions in unripe papayas. The latex is either sun-dried or oven-dried and sold in powdered form to be used in beer clarifiers, meat tenderizers, digestion aids, wound debridement aids, tooth-cleaning powders, and other products. The 'Solo' papaya is not a good variety for papain production due to its low yield of papain.
- The papaya fruit is about 88.8% water, 9.8% carbohydrate, 0.8% fiber, 0.6% protein, 0.6% ash, and 0.1% fat. A 100 g (3.5 oz) serving of papaya has 39 calories, compared to banana's 92 calories. Papayas also contain 16% more vitamin C than oranges and are a good source of vitamin A (about half of that contained in mango). Consumption of the fruit is reported to aid digestion because of the papain content.

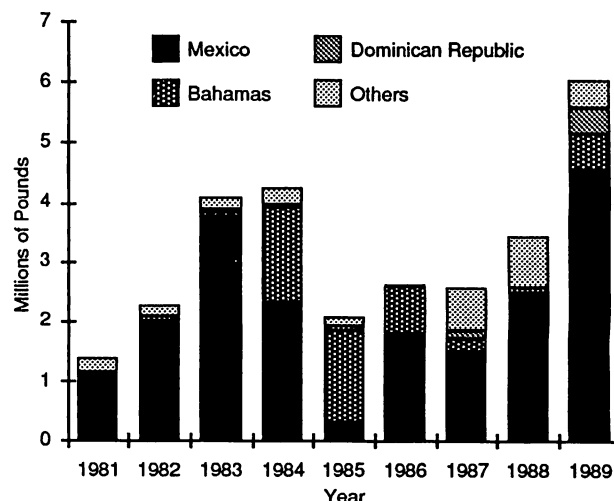
### WORLD SUPPLY

- World papaya production increased from 3.2 billion lb in 1976 to 8.1 billion lb in 1988. In 1988, Brazil was the world's largest papaya producer, accounting for 43% of the total world production. Other major producers were Mexico (17%), India (9%), Indonesia (7%), and Zaire (5%). Only a small percentage of the world production is traded internationally, as most of the papaya is consumed domestically.

## SELECTED MARKETS

### THE UNITED STATES MARKET

- Per capita consumption of fresh fruit in the United States was estimated at 97 lb in 1988. Per capita consumption of papaya during the same year was 0.15 lb, much lower than banana (24.15 lb), pineapple (1.81 lb), and avocado (1.62 lb).
- In the United States, Hawaii is the major producer and supplier of papaya, with 2500 acres in 1989. It is also estimated that there were 350 acres of papaya grown in Dade County, Florida, in 1987-88.
- The United States also imports papaya from foreign countries. In 1989, the United States imported 6 million lb of fresh papaya at a CIF (cost, insurance, and freight) value of \$1.1 million. Mexico was by far the largest supplier, with 76% of the total. Other major suppliers were the Bahamas (9.7%) and the Dominican Republic (7.5%).
- Foreign imports of fresh papaya to the United States increased from 1.4 million lb in 1981 to 6 million lb in 1989. In 1985, imports declined primarily due to the drop in Mexican imports from 2.3 million lb in 1984 to 288,600 lb in 1985.
- The overall average U.S. import price (CIF) for fresh papaya was 18.8¢/lb in 1989. The average import prices of major suppliers were 13.6¢/lb from Mexico, 37.5¢/lb from the Bahamas, and 19.1¢/lb from the Dominican Republic.



U.S. Imports of fresh papaya, 1981-89

## U.S. imports of papaya products, 1989

Product	Quantity (1000 lb)	CIF Value (\$1000)
Fresh papaya	6,030	1,133
Dried papaya	1,299	941
Papaya pastes and puree	525	160
Papaya pulp, prepared or preserved	463	149
Papaya (except pulp), prepared or preserved	2,604	1,151
Papaya, frozen, cooked or uncooked	483	235

- In addition to fresh papaya, the United States imported over 5 million lb of processed papaya products in 1989, valued at more than \$2.6 million.
- The characteristics of consumer demand for fresh papayas in Los Angeles were surveyed in 1984. The results indicate that availability of quality papayas, lower prices, and more promotion of the fruit (focusing on the nutritional value, uses, and determination of ripeness) could help expand the market.
- *The Packer: 1989 Produce Availability & Merchandising Guide*, published by Vance Publishing Corporation, contains a list of papaya shippers. Shippers are listed by state: California, Colorado, Florida, Georgia, Hawaii, Illinois, Indiana, Michigan, New Jersey, New York, Oregon, Pennsylvania, Texas, Utah, and Washington.

### THE EUROPEAN MARKET

- The European Community (EC) imported 11.2 million lb of papaya in 1987, almost four times more than in 1983. Although the papaya market has grown, imports are relatively small compared to those of other tropical fruits such as banana (4.9 billion lb), pineapple (525.6 million lb), and avocado (254.4 million lb). The type of tropical fruit desired and the amount demanded differs for each country, reflecting the size of ethnic minority groups, population, ties to supplying countries, and the market structure.
- In 1987, the Federal Republic of Germany (3 million lb) and the United Kingdom (2.3 million lb) imported about 47% of the total EC papaya imports. Brazil was the major supplier, with more than 50% of the EC market share. Other

suppliers include Costa Rica, Ivory Coast, and the United States.

- According to a 1987 study by the International Trade Centre (ITC) UNCTAD/GATT, the market for papaya in Western Europe is expected to continue growing. Large-volume imports are not foreseen, however, as consumers believe papaya is similar to less expensive melons from Mediterranean countries.

### THE ASIAN MARKET

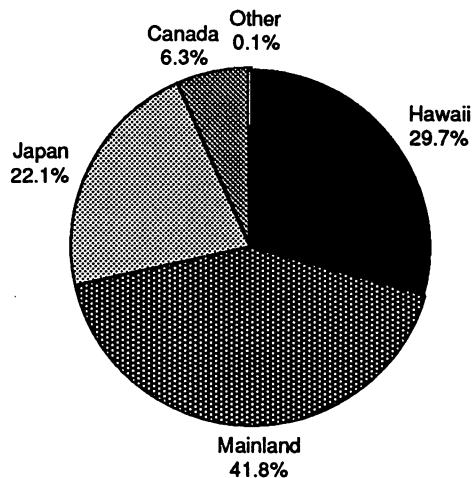
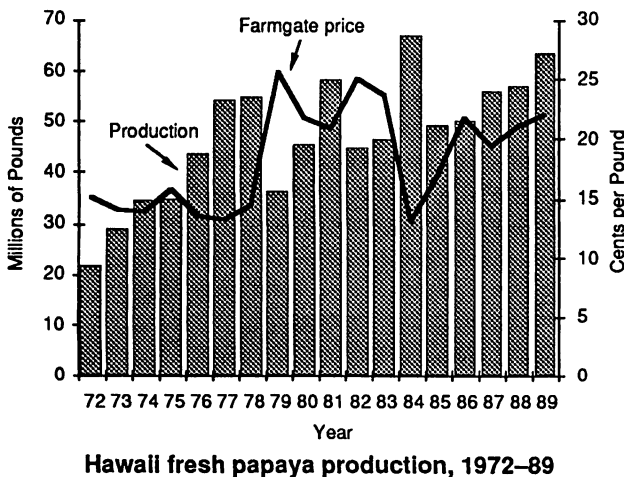
- In 1988, the volume of bananas (1.7 billion lb) imported to Japan was the highest among fresh tropical fruits. The next highest was pineapple (303.9 million lb), followed by mango (11.6 million lb) and papaya (11.5 million lb).
- Japan's imports of papaya in 1988 were up 31% from the 8.8 million lb imported in 1986. Most of the papaya is from Hawaii, with a small quantity from Fiji. The Philippines is a potential competitor for Japan's market due to the emergence of 'Solo' papaya production.
- Besides Japan, Singapore and Hong Kong are other primary importers of papaya in Asia. In 1985, Singapore and Hong Kong imported 25.1 million lb and 9.3 million lb of papaya, respectively. Major suppliers were Malaysia and Thailand.

### PAPAYA IN HAWAII

- In 1989, the total farmgate value of papaya in Hawaii was \$14.4 million for the 74 million lb harvested from 325 farms. Eighty-six percent of the harvested papaya was consumed as fresh fruit, while the rest was processed.
- Production of papaya (fresh and processed) in Hawaii in 1989 was almost three times that in 1972. Storms affected production in 1979 and 1985. Poor weather, disease, and Hurricane Iwa contributed to the decline in production in 1982.
- Most of the commercial papaya production is in Puna on the Big Island. In 1989, about 97.4% of the papaya was produced on the Big Island, followed by Kauai (1.3%), Oahu (1.1%), and Maui and Molokai (0.2%).



- In 1989, the average farmgate price of papaya for the fresh market was 22¢/lb, while the average Honolulu wholesale price was 34.7¢/lb. The average farmgate price for processed papaya was considerably lower at 3¢/lb.
- The 1989 market supply of fresh papaya for the state of Hawaii was 18.8 million lb. The major market was Honolulu (78.2%), followed by the Big Island (10.1%), Maui and Molokai (8.5%), and Kauai (3.2%).
- During 1989, 44.6 million lb, or 70% of Hawaii's production of papaya for the fresh market, was exported out of state. The primary overseas destinations were the U.S. mainland (26.6 million lb), Japan (14 million lb), and Canada (4 million lb). The major markets on the U.S. mainland were Los Angeles (61.4%), San Francisco (10%), and New York City (9.4%). The average wholesale prices for Hawaii papaya in these markets were 97.5¢/lb, \$1.15/lb, and \$1.18/lb, respectively.
- Fruit flies are a major postharvest and export problem for Hawaii papaya growers. Treatments used include double-dip hot water and vapor heat. These treatments have replaced the use of ethylene dibromide (EDB), which was banned in 1984 by the Environmental Protection Agency. The double-dip treatment may lose certification for papayas destined for the U.S. mainland. A dry-



Market destinations for Hawaii's fresh papaya, 1989

heat treatment has been approved and awaits certification, however. Other techniques being researched to deal with the fruit fly include irradiation and wrapping fruits with semipermeable shrinkwrap films.

- Another approach to the fruit fly problem is to eliminate them from the state. Possible methods include eradication through the use of bait sprays, male annihilation, and release of sterilized flies.
- The Papaya Administrative Committee (PAC) and the Hawaii Papaya Industry Association (HPIA) are two Hawaii organizations involved with papaya. The PAC was established in 1971 to organize papaya marketing in the state and conduct promotional programs. The HPIA conducts annual conferences, which provide a forum for interaction between the private and public sectors.
- Papayas marketed in and exported from Hawaii are subject to a Federal Marketing Order, which is enforced by the PAC in cooperation with the Hawaii Department of Agriculture. Fresh papayas are divided into various grades according to size and quality specifications. Quality considerations include degree of ripeness; injury by insects, disease, or mechanical means; internal hard lumps; and uniformity of size.

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Hawaii Agricultural Experiment Station, HITAHR, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. Noel P. Kefford, Director and Dean.

The authors thank the Papaya Administrative Committee for providing market data. A list of references is available from the authors upon request.

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