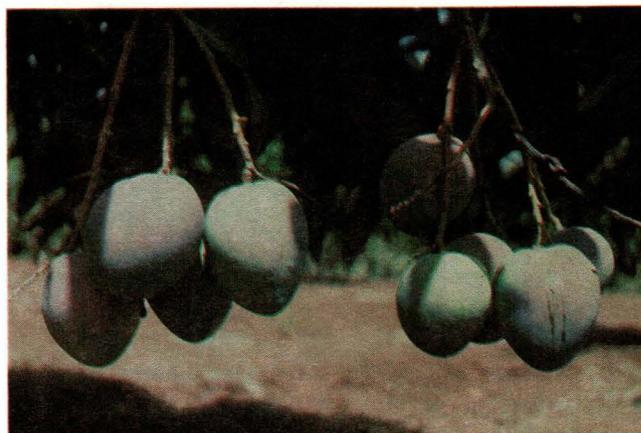


Mango

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CROP PROFILE

SPECIES AND CULTIVARS

- Mango, *Mangifera indica* L., probably originated in the Indo-Burma region and is currently cultivated in many tropical countries and frost-free regions in the subtropics. It has been cultivated for more than 4000 years and is said to be as important to the tropics as apples are to temperate America and Europe.
- There are two types of mango varieties: monoembryonic (seed producing one seedling only) and polyembryonic (two or more plants from each seed). 'Haden' and 'Pirie' are examples of the former, while the so-called common or Hawaiian mango is an example of the latter. Most improved varieties are monoembryonic, which do not produce true from seed and are grafted to seedling rootstocks.
- India is the world's largest producer of mangos. It has been estimated that there are over 1000 commercial varieties in India, where mangos are often called the "king of fruits." Among the principal varieties are 'Alphonso', 'Bangaoupalli', 'Dashehari', and 'Bangalora'. Besides being a popular table variety, 'Alphonso' is suitable for processing, since it retains its characteristic flavor.

- 'Ah Ping', 'Fairchild', 'Gouveia', 'Harders', 'Keitt', 'Momi K', 'Pope', and 'Rapoza' are varieties currently recommended for Hawaii by the College of Tropical Agriculture and Human Resources, University of Hawaii.
- 'Tommy Atkins', 'Kent', and 'Keitt' are popular varieties in Florida and Mexico. 'Van Dyke' is also important in Florida, as are 'Haden' and 'Oro' in Mexico.
- In the Philippines, 'Carabao' is an important variety that is consumed locally and is exported. 'Pico' is another important variety, which is mainly sold locally.

PRODUCTIVITY

- Mango trees can produce fruits in three to five years when propagated vegetatively and at least five years when grown from seeds. The tree can remain in production for 40 years or more.
- Mango trees can be grown on light sandy loams to red clay soils with a pH of 5.5 to 7.5. Rich, deep, well-drained soils and moderately sloping sites are preferable. The trees are best adapted to hot, dry areas with less than 60 in. of rainfall a year and can be grown from sea level to an elevation of 1500 feet.

Country	Selected Cultivars	Marketing Season
Australia	Kensington, Glen, Keitt, Kent	October to February
India	Alphonso, Bangaoupalli, Dashehari, Bangalora	June to October
Indonesia	Harumanis, Dodol, Gedong, Golek	—
Mexico	Haden, Oro, Julie, Esmeralda, Kent, Keitt, Tommy Atkins	April to October
Philippines	Carabao, Pico, Julie	June to September
USA-Florida	Keitt, Irwin, Haden, Lippens, Tommy Atkins, Kent, Van Dyke	June to September

- Trees should be spaced 35 to 40 feet apart. Production can be increased in early years by planting an extra tree in the center of a 40-foot square, but this tree should be removed later to prevent overcrowding.
- Many mango cultivars have yields that may vary from year to year. In 1981, the average yield for mango in Pakistan was about 8500 lb/ac, compared to 7700 lb/ac for the Philippines and 5100 lb/ac for Indonesia.
- Mangos should be harvested before they are fully ripe. In Hawaii, the harvesting season is usually between June and September. Mature mangos can be stored for two to three weeks at 50–55° F.

PRODUCTS AND USES

- The size, shape, and skin color of mango fruits can vary, depending on the cultivar. Fruits weigh about a quarter-pound to three pounds and may be round, ovate, or obovate. The skin color of immature fruits is green. Upon maturity, fruits turn yellow, orange, purple, red, or a combination of these colors, depending on the variety. Some varieties remain green when mature.
- Mature mangos have a pale-yellow to deep-orange flesh, which can have a subacid to sweet flavor. Most consumers prefer mangos with fiber-free flesh to those that are stringy. Some undesirable seedlings or varieties are described as possessing a turpentine-like off-taste.
- Mango can be eaten raw as a dessert fruit or processed to various products. Ripe fruits can be sliced and canned or processed to juice, jams, jellies, nectars, and preserves. Eastern and Asian cultures use unripe mangos for pickles, chutney, and relishes. In India, unripe mangos are sliced, dried, and made into powder for amchoor, a traditional Indian preparation used for cooking.
- In India, flour is made from mango seeds. Seeds are also eaten during periods of scarcity. The timber is used for boats, flooring, furniture, and other applications.
- Raw mango consists of about 81.7% water, 17% carbohydrate, 0.5% protein, 0.3% fat, and 0.5% ash. A 100 g (3.5 oz) serving of raw mango has 65 calories and about half the vitamin C found

in oranges. Mango contains more vitamin A than most fruits.

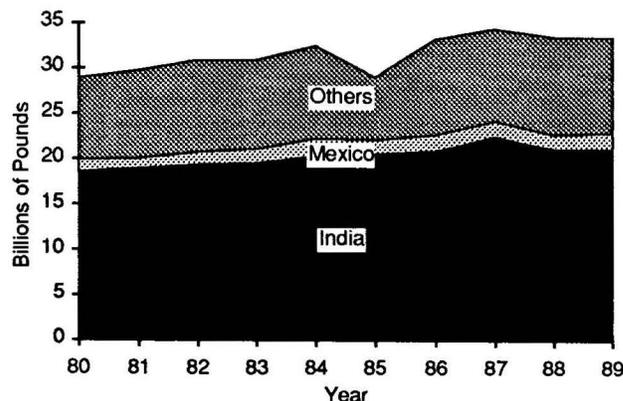
WORLD SUPPLY AND DEMAND

WORLD SUPPLY

- According to FAO estimates, world mango production was 33.1 billion lb in 1989. India produced 63% of the total production. Other major producers were Mexico, Pakistan, China, Indonesia, Brazil, and the Philippines.
- India and the Philippines were the dominant mango exporters in the mid-1970s. Currently, many other producing countries are also exporting mangos.
- During the 1986 fiscal year (April 1985 to March 1986), India exported 36.2 million lb of fresh mangos. Middle East countries—the United Arab Emirates (54.6% of the total exports), Saudi Arabia (19.9%), and Kuwait (11.1%)—were the primary destinations for India's exports.
- The Philippines exported 29.9 million lb of fresh mangos in 1988. Japan received over 45% of the exports, followed by Hong Kong (39%), Singapore (9.9%), and Australia (3.9%).
- Mangos are available year-round in various import markets. Countries such as Brazil, Peru, and Venezuela are major suppliers during winter, while Mexico, Haiti, India, and the Philippines are major suppliers during the spring and summer seasons.

WORLD DEMAND

- Mangos are consumed primarily in the producing countries. However, mango imports in Euro-

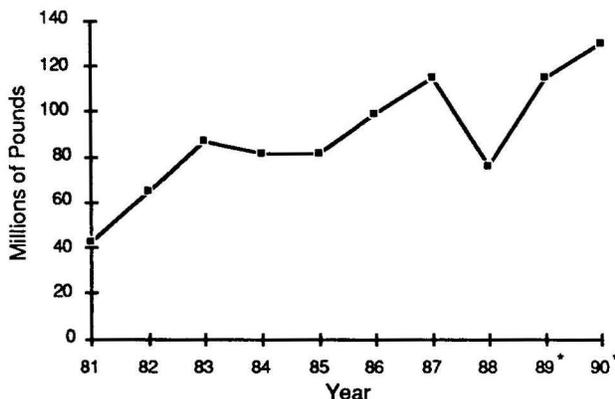


World mango production, 1980–89

pean and North American markets have increased ten-fold since 1975. Demand has also steadily increased in other areas, such as the Middle East and Japan.

THE UNITED STATES

- Florida is the main producer of mangos in the United States. In 1990, 2800 ac of mangos were planted in Florida, of which 2500 ac were harvested. The farm value of the 19.3 million lb produced was \$4.7 million. Mangos are also produced in Hawaii and Southern California.
- In one decade, U.S. imports of fresh mangos increased from 42.4 million lb in 1981 to 139.8 million lb in 1990. [Starting in 1989, import statistics for fresh mangos are combined with those for fresh guavas and mangosteens. The imports reflected in the statistics, however, are believed to represent mainly mangos.]
- In 1990, the CIF (cost, insurance, and freight) value of fresh mangos imported to the United States was \$65.2 million. Mexico was the largest supplier, accounting for 86.3% of the volume imported, followed by Haiti (13.2%). Sixty-one percent of the fresh mango imports entered the United States between June and August in 1990.
- The United States also imported various processed mango products at a CIF value (including guava and mangosteen) of \$11.8 million in 1990. Mexico supplied about 42% of the mangos, prepared or preserved. Brazil and the Philippines together supplied more than 52% of the mango and guava pastes and purees, cooked.



* included guavas and mangosteens

U.S. imports of fresh mango, 1981-90

1990 U.S. imports of mango products

Product	Quantity (1000 lb)	CIF value (\$1000)
Mangos, guavas, and mangosteens, fresh	129,816	65,188
Mango and guava pastes and purees, cooked	15,307	6,657
Mangos, prepared or preserved	4,979	3,560
Mangos, guavas, and mangosteens, dried	372	737
Mangos, prepared or preserved by vinegar or acetic acid	1,044	785

- American consumers seem to prefer mangos with strong red skin color. Color can be increased by treating mangos with ethylene in banana ripening rooms.
- *The Packer: 1989 Produce Availability & Merchandising Guide*, published by Vance Publishing Corporation, lists various shippers of mangos in the United States. Shippers in Canada are also included.
- In 1990, the United States exported 15.8 million lb of mangos, guavas, and mangosteens at an FAS (free alongside ship) value of \$12.2 million. The Netherlands (49% of the quantity exported), Canada (27%), and the United Kingdom (20%) were the major destinations.

SELECTED MARKETS

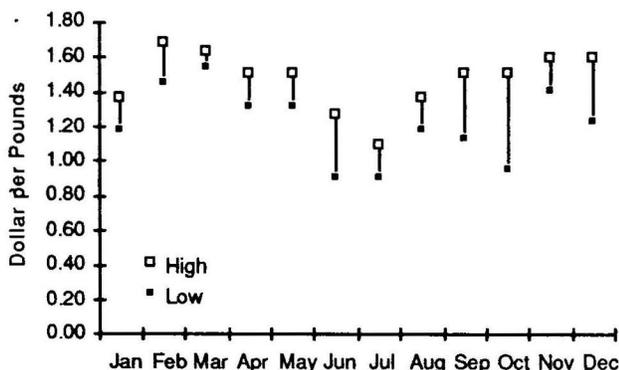
ASIA

- In 1989, Hong Kong imported 14.6 million lb of fresh mangos at a value of \$6.2 million. The Philippines supplied 91.9% of the total quantity imported. Thailand, the second largest supplier, accounted for only 6.2% of the import market share.
- Singapore imported 24.3 million lb of fresh and dried mangos, avocados, guavas, and mangosteens in 1989. The major suppliers were Malaysia (44.2%), Thailand (26.2%), and Pakistan (19.7%).
- Japan imported 11.6 million lb of fresh mangos in 1988. The Philippines accounted for 79%, followed by Mexico (18%), Thailand (1%), Taiwan (1%), and others (1%).
- A special permit must be issued to allow mangos from specific countries to enter Japan. Some

mango cultivars, such as 'Carabao' from the Philippines and 'Irwin' from Taiwan, are permitted entry to Japan after proper vapor heat treatment. Physiological disorders can be a problem, however, as the treatment causes internal breakdown in some mangos from the Philippines.

WESTERN EUROPE

- Import statistics for mangos, guavas, and mangosteens are combined for the European Community (EC). Most of the imports are mangos, however, since guavas and mangosteens are of minor importance.
- In 1989, the EC imported 80.9 million lb of mangos, guavas, and mangosteens. The major importers were the United Kingdom (24 million lb), France (19.6 million lb), the Netherlands (16.4 million lb), West Germany (12.1 million lb), and Belgium-Luxembourg (4.3 million lb). The Netherlands re-export a significant portion of their imports to other EC countries.
- Several countries supply mangos to the EC, and no one country dominates the market. In 1989, some primary suppliers were the United States (10 million lb), Brazil (8.3 million lb), Mexico (6.9 million lb), Venezuela (6.4 million lb), the Ivory Coast (4.6 million lb), South Africa (4 million lb), and Mali (3.3 million lb).
- According to a 1987 International Trade Centre study, Asian and West Indian immigrants are major consumers of mangos in the United Kingdom. Immigrants generally prefer green-colored



1987 wholesale prices of mangos in the United Kingdom

mangos from their countries of origin, such as the 'Alphonso' from India. Demand from the indigenous population has been increasing. These consumers desire colorful red/violet/yellow American varieties such as 'Haden', 'Irwin', 'Keitt', 'Tommy Atkins', and 'Kent'.

- Monthly average wholesale prices for mangos in 1987 ranged from \$0.91/lb to \$1.68/lb in the United Kingdom, \$0.73/lb to \$1.91/lb in France, and \$1.00/lb to \$1.45/lb in the Federal Republic of Germany. Prices are generally lower from May to September because of the large supply of domestically produced summer fruits.

MANGO IN HAWAII

- Mangos are popular as a backyard tree in Hawaii. For commercial production, it was estimated that there were 15 bearing acres of mango trees in 1989 and an additional 15 nonbearing acres. The bearing acres are on Maui (6 ac), Kauai (6 ac), and Oahu (3 ac).
- Honolulu is the major market for mangos in Hawaii. In 1989, Honolulu arrivals of fresh mangos amounted to 42,000 lb, 79% of which came from Oahu. The other 21% were from Kauai and Maui. Most of the supply arrived in Honolulu from July to October. The supply of mangos available is even larger when backyard production is considered.
- Fresh mangos from Hawaii are not permitted in the U.S. Mainland, Japan, and various other countries due to quarantine restrictions related to fruit flies and the mango seed weevil.
- Anthracnose is the most common disease of mango in Hawaii. Other diseases include stem-end rot, sooty mold, powdery mildew, and tip burn. Mediterranean and oriental fruit flies, mango weevil, scales, and red-banded thrips are some of the insects affecting mangos.
- The mango commodity fact sheet published by CTAHR provides information on horticultural practices in Hawaii. Topics covered include propagation and cultural practices, irrigation, fertilization, and pruning.

Reference to a company or product name does not imply approval or recommendation of the product by the College of Tropical Agriculture and Human Resources, University of Hawaii. Research for this publication was funded by the Agricultural Diversification Project, administered by the USDA.

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

A list of references is available from the authors upon request.