Papaya Production in Hawaii

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Introduction: Despite the fact that the papaya *(Carica papaya L.)* has long been important to the tropics, it was only in the last 20 years that the papaya has become one of the important fruit crops in Hawaii. In the late 1950's there were 750 acres of papaya in the State while in 1973, an average of 1,430 acres produced 32.8 million pounds. The principle producing area is in the Puna district on the island of Hawaii.

The papaya is a herbaceous plant native to tropical America belonging to the family Caricaceae and noted for its special flavor and continuous fruiting habit. The plant is rapid growing, producing ripe fruits in 10-12 months of age under favorable environmental conditions. Being a short-lived perennial, a commercial field is usually kept for three years, at which time the trees are too tall for hand harvesting.

Most of the papayas are cultivated on broken "a'a" lava rocks with little weathering of the parent basalt material. Rainfall of about 100 inches is well distributed throughout the year in this area. The remaining acreage of papaya are being grown in low humic latosols on all the islands where rainfall ranges from 20-60 inches annually. Most soils where papaya is grown are acidic, ranging in pH of 4.5 to 6.0.

The temperature in the papaya-growing areas is considered warm, ranging from a mean maximum temperature of 79 degrees F to a mean minimum of 68 degrees F. The elevation where most of the papaya is grown ranges from sea level to 500 feet.

Cultivars: The solo-type is the major papaya cultivar grown by commercial as well as home growers and the pear-shaped fruit is preferred. Various types of papayas have been introduced throughout the years, but the solo type has persisted and local breeders have utilized this character in their breeding programs.

The solo papaya is propagated from seeds that are usually self pollinated, giving a ratio of 2 hermaphrodites producing pear-shaped fruit to 1 female which has rounded fruits. There is no apparent difference in quality of the different shaped fruits. One of the first strains of solo was 'line 5', followed by 'line 8' and the special 'Kapoho' or 'Puna' solos. 'Line 10', 'Sunrise', 'Waimanalo', 'Higgins' and 'Wilder' are more recently developed cultivars. Of all the cultivars, 'Sunrise' is the only cultivar with pink flesh color, all others having yellow flesh.

Environmental effects are very critical with papayas and one cultivar grown for export in one area in the State may not perform well at another location by affecting the production, size and quality of fruits. Female sterility (bearing skip), carpellody of stamen (cat-facing) and compacting of fruits are other characteristics of different cultivars.

Cultural Methods: The general preparation of land prior to planting is clearing the forest of vagetation with a bulldozer. Various blocks are cleared by pushing all the vegetation to a windrow which surrounds each field. After grading and rolling the field, furrows are scarified through the field and one-foot wide basins are made in the furrows. In areas with soil, similar methods are employed.

Most commercial fields are direct seeded with about 20 seeds after a complete fertilizer has been applied. The spacing varies but with

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machines going through the orchard, rows 11 feet apart and plants 8 feet within the row is used. When the plants are 6-8 inches tall they are thinned to 3 plants per hill. The final thinning is done as soon as the flowers appear and can be determined if the tree is hermaphroditic or female. At which time one hermaphroditic plant is kept.

Fertilization practices on papaya vary depending on the soil type, location, rainfall and age. On broken lava rocks, plants must be fertilized more frequently than in soil. In general a complete fertilizer mixture of 10-10-10 formulation is applied throughout the growth of the plants.

Weed control in the papaya orchard consists of a pre-plant application of paraquat before seeding with a pre-emergence and post-emergence application of diuron only after 6 months of growth.

Some of the more common diseases on papaya are anthracnose which attacks the fruits, phytophthora infesting both the fruit and plant, powdery mildew in the leaves and fruits and the Rhizopus fruit rot. Anthracnose and phytophthora can be controlled by spraying with Diathane M-45, mildew by wettable sulphur and Rhizopus fruit rot by hot water treatment.

The papaya mozaic and ring spot virus are common in certain areas and certain precaution has been taken to prevent the spread of viruses to the major growing areas in Puna. Likewise, nematode is not a problem except in areas with soil.

Mites are a very serious pest on papayas and can be easily controlled by wettable sulphur. Of the major insect pests, the melon,. oriental and mediterranian fruit flies are of concern and impose strict quarantine to most Hawaiian-grown fruits. Aphids and thrips also cause damage and are controlled by malathion spray.

Harvesting is done by hand and with a special pole harvester on most small farms. When the tree grows too tall to pick from the ground, harvesting becomes a problem and the University of Hawaii has developed a harvester designed like a cherry picker. Fruits are harvested when they show a tinge or more of yellow and hauled to the packing shed or processing plant. At the plant they are hot-water treated to prevent fruit rots, fumigated with ethylene dibromide for export, packed in paper cartons and refrigerated for shipment.

Yield and Market: The estimated yield of some Puna growers average 38,000 pounds per acre the first year of harvest and about 25,000 pounds the second year. After the third year the trees are too tall and fruits are damaged when harvested, thus the harvester is a definite asset in extending the harvesting duration of the crop.

Fresh papaya is marketed locally, to the mainland United States and to Japan. Due to improved transportation facilities, new markets, improved handling practices, better marketing methods and an increased damand for Hawaiian papayas, exports are expected to continue. Processed papaya products on the other hand have been limited in sales but with new, improved products the future looks bright.

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U. S. Mango Imports and Production in Hawaii

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Introduction

The mango (*Mangifera indica* L.) is an evergreen tropical tree belonging to the family Anacardiaceae. The more familiar cashew nut is a member of this family. The flowers are borne on terminal panicles. On a panicle there are as many as 1500 flowers or more, most of which are staminate. The fruit is a drupe and are borne singly or in clusters. The size of the fruit varies from a few ounces to as much as 2 or 3 pounds. In Hawaii, the fruiting season begins as early as April and ends as late as October. The long season is primarily the result of cultivars coming into bearing at different times of the year.

Production Areas

The cultivation of mangos extends within the region between 23° North and South latitude, with the center of production in India. Other important producing countries include Indonesia, Philippines, Pakistan and Bangladesh, Thailand and Mexico. The total world production of mangos is estimated at 9.5 million tons of which 7 million tons is produced in India. World trade in fresh mangos is small.

In the United States mangos are grown in Florida and Hawaii. The total estimated acreage in Florida in 1973 was 1450 acres. Production during the same year was estimated at 250,000 bushels (1 bushel = 55 lbs) or 13,750,000 pounds. Hawaii has 125* acres producing approximately 1,250,000 pounds. Supplementing this supply, however, is an abundance of mangos in Hawaiian home gardens. Fruits are sold locally or are exported to Canada.

Since Florida and Hawaii do not produce adequate quantities of mangos, fresh and processed mango imports are beginning to exceed the quantity being produced by growers in the United States. In 1973, total imports amounted to 10,057,000 pounds. In 1974, imports increased to 15,179,000 pounds, most of which was fresh fruit. The largest suppliers of mangos to the United States are listed in Table 1. Mexico supplies the bulk of the imports.

Table 1. Total Mango Imports into U. S. Fresh and Preserved.

Country	1973 (pounds)	1974 (pounds)
Mexico	6,938,000	12,066,000
Haiti	2,303,000	2,138,000
Taiwan	250,700	177,600
India	237,600	487,800

1973 statistics obtained from Mexico, the largest exporter of mangos to the United States, show that in 1973 there were approximately 71,500 acres in mangos with an estimated production of 600 million pounds. Of this production, about 7 million pounds were exported to the United States and the amount doubled to 12,000,000

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*¼ acre or larger.