

# PAPAYAS



*Presented by*



**WIFSS**  
Western Institute for  
Food Safety & Security

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This production summary provides an overview of papaya growing, harvesting, and post harvesting practices. There are some common practices that many large commercial growers use when producing papayas, and though there are variations in these practices, having an understanding of the most common methods used will be helpful when carrying out regulatory activities.

## By the end of this summary, you will be able to:

1. List the top producing regions in the U.S. and world for papaya production.
2. Identify the most common farming practices used in the production of papayas including the use of equipment and manual labor.

## INTRODUCTION

The papaya plant, *Carica papaya* (care-ica pa-pi-uh), is a short-lived herbaceous plant native to tropical climates in the Americas. Papayas are a fleshy fruit that were nicknamed ‘tree melons’ by early

European explorers, but papaya fruit is actually considered to be a berry.

Papayas are the fourth most traded tropical fruit following bananas, mangoes, and pineapples. Approximately 75 percent of the world’s papayas are produced in only ten countries. India leads the world in papaya production followed by Brazil, Indonesia, Nigeria, and Mexico. In the United States, papaya production represents only about 0.1% of total world production.

Although the United States does not produce a significant number of papayas, it is the world’s largest papaya importer.



Fig 1 - Top Papaya Producing States in the US



Over 95 percent of papayas imported into the U.S. are sold domestically as fresh fruit. Mexico supplies approximately 75% of the papayas imported into the United States between March and mid-June.

In the U.S., most commercially grown papayas are produced in Hawaii, California, Texas, and Florida (Fig 1). In Hawaii, over 95% of papayas are grown on the Island of Hawaii, better known as “The Big Island.” In general, Hawaiian papaya plants can bear fruit year-round. However, hot, dry weather can affect production by causing temporary sterility of the plants.

In California, most papayas are grown in the San Joaquin Valley where the growing season is from February to November. Because of this shorter growing season, California papayas tend to be smaller in size and marketed in the green stage.

In Texas, most papayas are raised in the lower Rio Grande Valley where cooler temperatures and the possibility of freezing temperatures usually limit plant survival to only a couple of years.

Florida's subtropical climate provides the best growing conditions for papayas in the continental United States. Papayas are grown year-round, largely in the Miami-Dade County area, with the largest production occurring during the summer and fall.

Papaya fruits are smooth skinned and vary widely in size and shape, depending on variety and type of plant. The fruits usually contain many seeds surrounded by a sweet smooth yellow to orange-red flesh.

The two principal varieties of papayas grown are small, or Hawaiian, and large, or Mexican. The small varieties are also referred to as the 'solo' type with the primary cultivars being Kapoho, Sunrise, SunUp, and Rainbow. The most abundant Mexican cultivar is Maradol.

## GROWING

Papaya trees are fast growing, woody, tree-like plants that produce best in temperatures between 70° to 90°F. They prefer full sun and well-drained porous soils that are moist in hot weather and dry in cold weather. Even brief exposure to freezing temperatures (32°F) can damage papaya plants, and prolonged exposure to cold without frost protection by overhead sprinklers will kill the plants.



Papayas are planted in rows with five to seven feet between individual trees, and eight to eleven feet between rows. Papayas generally grow to between 10 and 12 feet tall, but can reach up to 30 feet in height. Plants used in commercial production are kept short because it is easier for crews to harvest the fruit from shorter trees.

The papaya is a large tree-like plant that grows as a single, hollow stalk with leaves and fruit at the top. If the plant is left unpruned, the main stem will not branch. Because of this, growers pinch, or prune, the seedlings to give the developing tree a better shape. Established plants are sometimes lopped at the top to encourage the development of multiple trunks. The papaya plant will generally branch when injured. Growers use this trait to produce secondary fruit-bearing branches by topping the plant after one or two years of growth. Tree topping is the practice of removing large sections from the tops of trees, leaving stubs that branch into multiple fruit-bearing branches as the tree continues to grow.

Papayas grow well in many soil types as long as there is adequate drainage. Water logged soil can lead to root diseases or even kill the plants if left unchecked for 24 hours or longer. In Hawaiian growing regions that receive regular rainfall, 'a'ala soils provide enough drainage and are used in the commercial production of papayas. However, it is usually necessary to add supplemental soil to the growing hole when seeds are planted. In U.S. mainland growing

regions that do not receive excessive amounts of rainfall, the soil type is less of a concern. In general, papaya plants prefer a near neutral soil pH (between pH 6.0 and 7.0). Application of fertilizers will vary depending on the soil type, climate, and season. To ensure good root development, organic material may be added to the soil before planting, and mulch may be spread on the surface after the seeds have been planted. Other slow-release fertilizers may be mixed into the soil or supplied to the plants through the irrigation system after about three months of growth. It is important to note that too much nitrogen will cause excessive vegetative growth of the plants and may result in soft fruit.

Watering of papayas is typically done through drip irrigation to prevent over watering. In growing regions that receive regular precipitation, irrigation may only be needed to supplement rainfall. In regions where rainfall is limited, growers may need to supply up to 10 gallons of water per tree each day during the fruit bearing period.

Papayas are susceptible to a variety of different insect pests including the papaya whitefly, papaya web-worm, hornworms, leafhoppers, aphids, and scale insects. Trees are sprayed or dusted to control these pests. Papaya trees may also be subject to infection by viral disease-causing agents. The development of genetically modified varieties of papayas that are able to resist Papaya Ringspot Virus (PRV), such as SunUp and Rainbow, have been very important to the U.S. Hawaiian papaya industry. Papayas



are also vulnerable to soil-borne pathogens. To help protect commercial papaya plants, growers may allow fields to go through a three to five year fallow period to reduce the number of soil-borne pathogens present in the field before planting papaya trees. Soil fumigation techniques may also be employed to reduce soil pathogens before planting as an alternative to allowing the field to sit fallow.

Papayas have three basic plant types: male, female, and hermaphrodites. The males produce only pollen, never fruit. Only female and hermaphrodite plants typically produce fruit. Wind and insects are needed for pollination of female plants, however, hermaphroditic plants can self-pollinate. Almost all commercial orchards contain only hermaphrodites.

Commercial papayas are grown from seeds planted in the field. Plants mature in six to nine months in warmer growing regions, and in 9 to 11 months in cooler regions. A mature papaya plant can produce as many as 100 fruits per growing season. Mature papaya plants naturally flower in the early spring and produce mature fruit in the summer or fall. Growers can manipulate when plants will produce fruit by removing the first fruits in the early spring, thus forcing the plant to re-flower and produce fruit six to eight weeks later. In growing regions further north where fall frost is possible, fruit must be harvested in the late summer or early fall to avoid damage by cold. Plants will continue to bear fruit for many years, but yields usually decline as the plant ages and picking becomes difficult. It's not uncommon in commercial production to replant the papaya plants after only two to three years. Certain varieties produce a pear-shaped or round fruit, which can weigh 12 to 30 oz. Some papaya varieties can produce fruit weighing 20 pounds.



Papaya harvesting typically occurs at different times depending on the purpose of the harvest, but in general starts after 'color break,' which is the time when the fruit starts to turn from green to yellow at the blossom end. Although ripe papayas of different varieties range in color from yellow to orange or red, all are green before ripening and are referred to as green papayas.

For export purposes, papayas are usually harvested from color break to one-fourth yellow. For local markets, harvesting is typically done when the fruit is one-half to three-fourths yellow. Papayas picked one-fourth to full yellow are sweeter than those picked green to one-fourth yellow because papayas do not increase in sweetness after picking.

Papayas are usually harvested by hand with workers standing on the ground. When harvesting larger trees, ladders or platforms rigged to tractors are used to lift workers. During commercial harvesting, sharp knives are used to trim the stem close to the base of the fruit. When the fruit is too high to harvest by hand, workers



Core Redford via flickr.com

Following harvest, papayas are packed by placing the fruit in a single layer in corrugated cardboard boxes that are lined with low density polyethylene foam.

### HOLDING

In preparation for shipment, papayas are cooled to help preserve the fruit and to halt ripening. The optimum storage temperature of harvested papayas is about 55°F for green to one-quarter yellow papaya and 45°F for ripe papayas that are over one-half yellow. Storage at temperatures colder than this will cause damage to the harvested fruit.



sometimes use specialized tools to reach the mature fruit. These devices may be fashioned from a pole with a rubber suction cup, an open-ended metal basket, or net at one end. Harvesters use the device to snap the stem of the papaya, causing the fruit to fall into the basket or net, or simply fall from the tree. Workers on the ground catch the falling fruit. Care must be taken during harvesting to avoid scratching the fruit which can cause leaking of latex fluid that can irritate worker's skin and stain the fruit's skin.

### PACKING

Harvested papayas may be held at 85°F and high atmospheric humidity for 48 hours to enhance coloring before packing. Standard decay control to prevent fruit rotting involves a 20-minute submersion in a hot water bath at 120°F followed by a cool rinse. Some operations may apply fungicides, such as Thiabendazole. Application of carnauba wax can also protect against postharvest rotting. Prior to shipment to the mainland U.S., Hawaiian papayas are sanitized by hot water treatment to prevent fruit fly introductions with the imported fruit; irradiation is also used to control fruit flies.

### CONCLUSION

**Having a basic understanding of the way papayas are grown, harvested, and cooled will provide the basic background information that will be helpful to regulators when completing inspections or investigations in the field.**

*The agricultural practices described in this production summary are common on most large commercial farms like those found in major papaya producing regions, and in the United States. There are undoubtedly variations in these practices depending on the region, operation size, and individual grower preferences. This is especially true of farms outside of the U.S.*

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