

# MANGOS



*Presented by*



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This production summary provides an overview of mango growing, harvesting, and post harvesting practices. There are some common practices that many large commercial growers use when producing mangos, 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 mango production.
2. Identify the most common farming practices used in the production of mangos including the use of equipment and manual labor.

### INTRODUCTION

The mango is a stone fruit which belongs to the *Anacardiaceae* family, which are flowering plants that produce fruits. Mangos are native to south Asia and is the national fruit of India, Pakistan, and the Philippines. Since the mango leaves are considered toxic and can kill cattle or other grazing livestock, mango growers and livestock owners need to be mindful about not locating grazing areas near mango groves and not feed production discards to animals.

Global production of mangos has doubled in the last thirty years. Most mango production is centered in India, China, Thailand, Pakistan, and Mexico, but there are currently more than 90 countries that grow mangos commercially. Countries in the Americas and Africa produce a small percentage of the world's mango crop each year—13 percent

and 10 percent, respectively. Asia, where the mango is native, is the largest mango-producing region, producing 77 percent of global supply annually. Within the U.S., a limited number of mangos are grown in Florida, Hawaii, California, and Puerto Rico (Fig 1). U.S. commercial production of mangos began with the introduction of the Haden variety of mango in 1863 in Miami.

International mango trade is increasing, with exports sold to European and U.S. markets. Most of the mangos sold in the United States are imported from Peru, Ecuador, Brazil, Guatemala, Haiti, and Mexico. Eighty-six percent of the mangos imported into the U.S. are supplied by Mexico, making this country the largest supplier to the United States.

Mango trees are deep-rooted evergreens that can grow to be very large. Depending on the variety, these trees can grow as tall as 90 feet with a canopy width of up to 80 feet and have leaves that are 12 to 16 inches long. Today the most popular cultivated mango varieties include: Tommy Atkins, Keitt, Kent, Osteen, Haden, and Valencia Pride.

Mangos have two growing seasons - spring through summer and fall through winter. Due to the alternate harvest times in the various growing regions around the world, the fruit is available year-round to U.S. consumers.

The immature fruit has green skin that gradually turns yellow, orange, purple, red, or combinations of these colors as the fruit matures. Mature fruit has a characteristic fragrance and a smooth, thin, tough skin. The pale yellow or orange flesh of ripe mangos is juicy, sweet, and sometimes fibrous.



**Fig 1 - Top Mango Producing States in the US**

## GROWING

Mangos can be grown in a wide range of soil types, from light sandy loams to red clay. Deep, rich, well-drained soils provide the best production and fruit quality. Some producers plant trees on sloping sites to prevent waterlogging the root system. Mangos grow best in ambient temperatures ranging between 70° to 75°F.

Commercial mangos are propagated vegetatively, meaning the trees are reproduced via asexual reproduction by grafting onto rootstock.

There are several main mango cultivars used in commercial production of the fruit. These cultivars are described as either polyembryonic or monoembryonic. Polyembryonic varieties can be grown from seed and produce trees that are true to type. Monoembryonic cultivars contain one embryo that has genes from both parents and produce a hybrid tree (mix of both parents), and therefore, must be reproduced vegetatively by grafting onto a root stock. Polyembryonic cultivars are often used as rootstock because they tend to be better adapted to local growing regions and soil conditions, and the grafted monoembryonic cultivars tend to produce fruit with characteristics that are preferred by consumers. Grafted trees usually begin producing fruit in three to five years, while trees planted from seeds usually take at least five years before bearing fruit. Mango trees can remain in production for 40 years or more.

Mango trees require space to grow and are generally planted in rows with 10 to 30 feet between individual trees and 20 to 30 feet between rows. Developing trees are pruned so that there are three to four main branches on the trunk at



different heights, and to remove any branches that are less than two feet from the ground. Mature trees are periodically trimmed to allow for better penetration of sunlight, spraying, and ease of picking.

Mango trees are annually fertilized with nitrogen, phosphorus, and potassium. Newly planted trees should be watered at planting and every other day for the first week, and then irrigated once or twice a week for the first couple of months. Mature trees do not need frequent watering because of the tropical climate in the regions where mangos are grown. Irrigation may be necessary during occasional dry periods, but the roots can become water logged if over irrigated.

Insect and fungal diseases are controlled by pruning diseased branches or spraying with insecticides or fungicides. Fruit flies can be a problem in certain growing regions and may limit distribution of the harvested fruit. For example, mangos produced in Hawaii are not permitted in the U.S. mainland, Japan, or other markets because of quarantine restrictions due to fruit flies and mango seed weevil. Mangos from other regions are treated in a hot water bath following harvest to eliminate pests and protect the fruit from decay.

Mango trees begin blooming in the winter months and continue through spring. Most blossoms function as males by providing pollen, but some are bisexual and are self-pollinating. Insects such as flies, wasps, and bees help accomplish pollination. Depending on the variety, the fruit may take from 100 to 150 days to mature, resulting in a late summer and fall harvest. The weight of the mature fruit may vary from one-quarter pound to two pounds and may be round or oblong depending on the variety.





## HARVESTING

Mangos marketed in the United States are usually picked at the mature green stage to withstand postharvest handling practices. Mangos are picked by hand or by using a long picking pole which has a canvas or nylon bag attached near a cutting blade to catch the fruit. Ladders and hydraulic lifts are also used to help pickers reach fruit high in the tree canopy. Mango fruits are usually picked before they are fully ripe with the stem intact and after they develop red, orange, or yellow color. The long stem assures that the internal latex, or juice, does not leak. The fruit are stored stem end down on racks to further prevent latex from dripping on other fruit. The fruit bruises easily and must be handled carefully to avoid damage.

## PACKING

Industry harvesting guidelines recommend that mangos be protected from exposure to direct sunlight while they wait transport to the packinghouse. Direct sunlight results in sunburn and higher flesh temperatures, which in turn accelerates



ripening and shortens potential shelf life. On most farms, the fruit may wait from 30 minutes to 6 hours before they are transported to the packinghouse.

Mangos can either be offloaded to the packinghouse in field crates or from trucks with large cargo holds. Upon arrival at the packinghouse, mangos are transferred into a water flume system, where they are sprayed and brushed to remove soil, latex and other organic materials. Next, the fruit is pre-sized and placed back into crates. Then, in order to control fruit flies, mangos are immersed in a hot water dump tank for a time period that can range from 65 to 110 minutes, depending on fruit variety, weight, and size. The hot water tank is filled with potable water at 115°F. Some packinghouses will then conduct a post-water treatment cooling, known as hydrocooling, after the hot water treatment to rapidly decrease the flesh temperature and reduce injury to the fruit. Hydrocooler water temperatures



are usually maintained between 70° to 72°F and the mangos are exposed to the cool water for about 30 minutes. Industry guidelines provide time and temperature recommendations for hydrocooler use with mangos to prevent water uptake into the harvested fruit.

The fruit is transferred back to a packing line and graded by weight and size in accordance with USDA standards and/or buyer requirements. Grading allows for removal of mangos that are misshaped, bruised, cut, or have signs of decay. Some fruit may undergo a coating of wax to improve natural fruit gloss and reduce water loss during holding and transport.

Mangos are packed into ventilated, single-layer cartons with or without lids. The openings in the cartons are important to ensure uniform temperature and humidity during storage and shipping.

## HOLDING

Prior to shipping, mangos are held in forced air-cooling rooms where the temperature is maintained at 54°F.



Mangos produced in other countries are often picked at the mature-green stage in order to withstand the postharvest handling steps required to export them from the production areas to the retail market. Upon arrival, this fruit can be treated with ethylene gas in holding chambers in much the same way bananas are held in ripening rooms to induce faster and more uniform ripening and provide ready-to-eat mangos that consumers prefer.

## CONCLUSION

**Having a basic understanding of the way mangos 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 mango 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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