



Economic Feasibility of Small-Scale Specialty Mango Production in South Florida

NORIS LEDESMA*

*Fairchild Tropical Botanic Garden, and Mumbai Farm,
10901 Old Cutler Road, Coral Gables, FL 33156*

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The local food movement and sustainable food production are gaining considerable interest in south Florida. Both of these innovative approaches to local farming warrant taking another look at mango production in South Florida. This research provides information that may aid farmers in the decision to invest in specialty mango production in South Florida. The primary objective of this study was to determine the potential profitability of a 1- to 2-acre small-scale specialty mango grove in south Florida. Data on production, costs, and returns were collected from Mumbai Farm, a private mango farm in south Florida. The grove consists of 1.5 acres, and it has not been used for agricultural activities during the past 20 years, providing the opportunity to quickly certify it as an organic grove. The project includes budgets, market observations, horticultural practices, and new mango cultivars for niche markets. It was assumed that the farmer would market their production via local markets and specialty wholesale.

The mango industry started in Florida more than 100 years ago. Today, mango is grown primarily in south Florida. In 2013, Florida's mango acreage was located in Miami-Dade County with 600 acres, concentrated between May to September. The remainder of mango acreage is located in Lee, Palm Beach, and other counties with an appropriate climate. (J.H. Crane, TREC, 2013).

Farms in Dade County are a mix of urban and rural locations, with size ranging from 1/4 of an acre to almost 30 acres. Farming experience of growers varies greatly. Some are very experienced in growing other crops and are diversifying into avocado, longan, mamey sapote, guava, others. They are others have no prior experience with farming. The smallest farms are usually growers' backyards that have been turned over to their farming efforts.

The mango continues to grow in importance in the local market due to interest in the local food movement and the poor quality of imported mangos. These have led to an interest in new mango plantings in Dade County. For small-scale specialty mango production in south Florida, growers have to be actively seeking alternative markets to increase their profitability.

The current status of the commercial local market, with regard to cultivars, is a predominance of 'Tommy Atkins', 'Keitt', and 'Haden'. There is no consensus within the industry in regard to new mango cultivars for the local market. The adoption of new cultivars will depend on the ability of the consumer to differentiate them in the marketplace; that is, a new cultivar must be readily distinguishable from imported mangos such as 'Tommy Atkins', 'Átaulfo', 'Kent', and 'Keitt' (Campbell and Ledesma, 2006).

The tropical fruit program at Fairchild Tropical Botanic Garden has been active in the selection of mango cultivars that can serve multiple roles for estate agriculture and niche commercial markets. These cultivars generally have a small tree size, favorable horticultural traits, disease tolerance, and excellent fruit quality.

They also have specific appeal with different ethnic groups in local markets (Campbell and Ledesma, 2004).

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LAND PREPARATION. First step was to remove existing shrubs and trees. Available organic material was allowed to decompose and was ground prior to being incorporated into the soil. The soils of Mumbai Farm are calcareous, which is typical for Miami-Dade County. A scarifying front-mounted plow on a large bulldozer crushed the oolitic limestone bedrock to a depth of 2 inches, mixing it with the organic material described above. Even after this operation, the scarified soil was not deep enough to grow mangos. To plant the trees, parallel holes were dug using a backhoe. Each hole had to be 3–4 times the diameter and 3 times deeper than the original mango tree container.

IRRIGATION. Winter temperatures, even in south Florida, are frequently low enough to cause cold injury, especially in young mango trees. Young trees may be killed at temperatures from 29 °F to 30 °F, while small fruit and flowers can be severely damaged by even a few hours at 40 °F (Crane et al., 2003). A micro aspersation irrigation system for cold protection was installed.

PLANTING. Mango trees were planted ~13 feet apart within rows with 19.75 feet between rows. Consequently, a mature stand would have about 170 trees per acre.

The cultivars 'Mallika', 'Nam Doc Mai #4', 'Angie', 'Yumbo Kesar', and 'Mumbai' were selected for the current study. Their characteristics are described below:

'Mallika' is a hybrid between 'Neelum' and 'Dasher', and is considered among the best of the new generation of Indian dessert mangos. The tree is semi-dwarf, making it attractive to mango growers outside of India, who are always looking for new niche markets around the world. The bright yellow fruit

*Corresponding author. Email: nledesma@fairchildgarden.org

have a flattened oblong shape, with a rounded base and an irregular, non-waxy skin. The fruit weigh from 10–18 oz. When properly ripened, the pasty, but completely fiber-free flesh is a deep orange, with an intensely sweet, rich and highly aromatic flavor. ‘Mallika’ fruit are harvested mature-green, before they break color on the tree and should be stored at a temperature of not less than 70 °F for 2–3 weeks for proper ripening. In this manner their ultimate eating quality will be achieved. The fruit can be refrigerated after it is completely ripe, but not before.

‘Nam Doc Mai #4’ is among the best dessert mangos from Thailand, with an exceptional appearance and eating quality. The fruit are long, slender and sigmoid, weighing from 12–16 oz. The ripe fruit range from a greenish- to canary-yellow and only rarely have a reddish blush on the sun-exposed shoulder. The flesh is soft and juicy, with a sweet and aromatic flavor. ‘Nam Doc Mai #4’ has better performance in south Florida and the tropics than in colder areas. In Thailand and throughout much of Asia, it encompasses what is most desired in terms of versatility and quality. While mature green, it is eaten raw and dipped in sauces. Mature green fruit are also used for making sweet preserves and pickles. When ripe, the fruit have a smooth, silky texture, a nice bouquet and are extremely sweet.

‘Angie’ was selected for home garden and estate agriculture in south Florida due to its compact growth habit, disease tolerance and overall fruit quality. The fruit are 400 g, oblong and saffron yellow with a classic Indian mango’s orange blush on the sun-exposed shoulders. The skin is smooth and has no visible lenticels. The flesh is tangerine orange and fiber free. The flavor is classified in the ‘Alphonso’ class of mangos with a rich sweetness and sophisticated profile like an apricot. It has excellent disease tolerance and, since it is an early season cultivar, it often can be harvested before the rainy season in south Florida. The tree is semi-dwarf and highly manageable with annual pruning. Size can be maintained at or below ~9 feet with consistent production.

‘Yumbo Kesar’ is from the Talala and Gir area of Gujarat, India. The fruit are large, averaging 10.5 to 14 ounces. They are oblique-oblong, have a green skin with rich saffron color flesh with no fiber. ‘Yumbo Kesar’ makes a good table fruit with its sweet taste and aroma. As with most other fine dessert mangos from India, ‘Yumbo Kesar’ is best harvested while hard-green and ripened at room temperature. In this manner one can expect an exceptional, multi-leveled flavor, from deep and resinous to the intensely sweet. The fruit are uncommon outside of India due to the green skin color.

‘Mumbai’ most likely originated from seeds from India. The fruit range from 10–12 oz and are a deep green color when fully ripe. When exposed to the sun they often develop a red shoulder. The skin is smooth, and the flesh is a deep orange, melting and juicy with little fiber. The flavor is rich and spicy, reminiscent of the finest of the Indian dessert types of mango. The fruit can be deeply scored around the middle and twisted to separate. The sweet, delectable flesh in the two halves can then be spooned out, leaving only the stone and the skin. ‘Mumbai’ has the potential to be a hit for specialty markets in the European Union.

Production Costs

Table 1. illustrates a sample budget, including: land preparation, orchard layout, planting, hole preparation, irrigation, fertilization, weed control, tree care and pruning, pest control, and miscellaneous. Fixed costs include: taxes, insurance and overhead expenses. The most farmers own their own land.

Table 1. Operating Annual Cost (Year 1 to 5).

6 x 3.5 m, density = 75 kilo/tree; 170 trees/acre	(\$/acre)
Operating Cost Year 1	
Tree Removal & Site Preparation	3500
Trees (2 gall)	2025
Holes	1200
Irrigation	5000
Fertilizers	100
Mow Middles, weeding by hand around trees	2500
*Grove Work & Hand Labor Pruning and shaping	00
Total Operating Cost year 1	12,188
Fixed Costs (Year 1 to 5)	
Overhead Taxes, insurance	750
Utilities	600
Total Fixed Costs/year	1350
Operating Cost Year/year (Year 2 to 5)	
Fertilizers	300
Mow Middles, weeding by hand around trees	2500
Grove Work & Hand Labor Pruning and shaping	00
Preharvest Cost	2800
Harvest and Marketing Cost	
Sales Charge @ 10% F.O.B Price	700
Pick & Pack	4000
Total Harvest and Marketing Cost	7700
Total Cost Year 1	13,538
Total Cost Year 2	4150
Total Cost Year 3	4150
Total Cost Year 4	4150
Total Cost Year 5	10,500
Total Cost for 5 Years of Production	36,420

Materials for the first year include trees at \$15.00 per tree, electricity for irrigation system, miscellaneous parts and supplies. The largest item in the first year, of course, is the purchase of 100 trees.

Harvesting and marketing costs are added to production costs. The main contributor to the harvesting and marketing costs is the cost associated with picking, and packing, including the cost of packing material. Together they account for 85% of the harvest and marketing costs and as much as 60% of the overall cost to produce and market mangos. The high harvest and marketing costs are due to mango harvesting methods and federal regulations (National Mango Board). Because the fruit is easily bruised and scratched, mangos are hand-picked, which makes harvesting a highly labor-intensive operation. The Mango Promotion, Research, and Information Order; Referendum Order is aimed at increasing grower returns by promoting orderly marketing conditions while at the same time ensuring consumer satisfaction.

Total preharvest and operating costs totaled \$2800 and fixed costs were estimated at \$1350 per acre, while total harvest and marketing costs were \$7700. The cost of production for year 1 requires an investment for \$13,538. The cost of production decreases following and subsequent years to \$4500.

Profitability Analysis

The primary objective of this analysis is to determine the expected profitability of small scale table mango production in

Table 2. Assumptions about Markets & Revenues.

Market share of yield revenue/pound		
Farmers Market (full price)	18.75%	\$2.00
Farmers Market (reduced price)	5.00%	\$1.50
Wholesale Market (full price)	37.50%	\$1.25
Wholesale Market (reduced price)	10.00%	\$0.75
Waste or lost yield	5.00%	\$0.00

south Florida. The analysis assumed a one acre family run grove producing specialty mangos, a 20-year horizon with no yield until the fifth year, and trees reaching full production in the seventh year. It is assumed that the family investor seeks to maximize wealth and that the specialty mangos will be sold through farmers markets, restaurants, chefs, and wholesale markets.

Currently, average yield is estimated at about 10,500 pounds per acre with average of production 165 pounds/tree. Single trees can produce between 220 and 330 pounds in years with heavy crop years. The projection shows that the production will increase after year 7 (Table 3). Assuming the production will increase from 165 pounds/tree by year 5 to 220 pounds/tree by year 7.

The analysis considers the assumption of actual prices per pound in farmer's markets vs wholesale (Table 2).

With a pack-out rate of about 90%, the quantity of saleable mangos is estimated at 9450 pounds per acre. Assuming an F.O.B. premium price of \$2.00 per pound the gross revenue is calculated at \$15,723 per acre. Subtracting the total cost of production and marketing by year 5, it (\$36,420) gives a net return to the growers of about \$20,687 per acre in year 5. By year 7, the returns will be positive and the grower's investment will be recovered. (Table 3).

The return appears more favorable in the following years. Even so it is a short-term strategy that is insufficient for maintaining a full-time operation. It easily can be assumed that growers remain in the industry for land speculation and more than likely than not have other sources of income.

Data and Methods

Production relationships, costs, and returns data came from both primary and secondary sources. Primary data was obtained from a grove demonstration in Homestead, Florida. Secondary data was from published enterprise budgets and other literature, as well as market observations.

Annual pro-forma budgets were estimated for a 20-year planning horizon. It was assumed that the mango grove does not yield until the third year and that full production begins in the sixth year and continues through the 20th year. It was assumed that the final product will be marketed via local farmers markets, chefs and wholesale markets. The investor is assumed to have a goal of wealth maximization. The net present value (NPV) method was used to help determine the profitability of this type of operation.

Development of the enterprise budgets based upon the assumptions of the study, experience from the demonstration mango grove, and input from horticulturists, other professionals and market observations. Revenues can be influenced by yield, markets, and product prices. The research assumed that the mango operation would have no yield in years 1 to 5.

Table 3. Gross Returns

REVENUE (year 5)			
Yield (pounds/acre)		(10,500 pounds/acre)	
Restaurants (full price)	38.00%	\$2.00	\$7980.00
Farmers Market (full price)	10.00%	\$2.00	\$2100.00
Farmers Market (reduced price)	5.00%	\$1.50	\$787.50
Wholesale Market (full price)	37.00%	\$1.25	\$4856.30
Losses	10.00%	\$0.05	\$0.00
Total Revenue Year 5			\$15,723.80
Total Revenue Year 6			\$15,723.80
REVENUE (year 7)			220 pounds/tree
Yield (pounds/acre)		(17,000 pounds/acre)	\$25,457.58
Total Revenue Year 7			\$25,457.58
Total Revenue Year 8 to 20			\$25,457.58 per year

Other Remarks

The Florida mango season runs from late June through September. Most of the state's commercial mango groves are found in Miami-Dade County, in the agricultural communities of Homestead and the Redland. To keep the industry viable, Florida growers can become even more creative by experimenting with new products and exploring new markets. Early cultivars can start the season in May. These cultivars include 'Mallika', 'Nam Doc Mai #4', and 'Angie', are generally small in tree size, have considerable disease tolerance and have fruit with excellent quality. They also have specific appeal with distinct ethnic groups.

The future of the mango industry depends at least in part on the selection, testing and adoption of new cultivars that can differentiate themselves in terms of eating quality and horticultural traits. Finding new cultivars and targeting new niches with an opportunity to increase profits is the one of the challenges facing small-scale producers.

The interest in farmers' markets has been increasing in south Florida during the last decade, bringing a greater demand for locally grown produce. Restaurants have much greater flexibility adapting their menus to accommodate seasonal availability of local produce than grocery stores and fast-food chains. Seasonal cooking has really come into style with the local food movement. The direct-from-farm sales model: Local growers favor setting up their own distribution channels.

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