

Cost Estimates of Establishing and Producing Thai Guavas in Florida, 2014¹

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Introduction

The primary purpose of this publication is to identify inputs, costs, and yields considered to be typical of a well-managed five-acre Thai guava orchard in south Florida. The information presented does not represent any one particular farm and is not intended to be a guide to production practices. Moreover, it is important to note that production costs and returns are highly variable, and as such the information presented should be considered as a rough guide for establishing and producing the crop.

Background

Within the United States of America, commercial production of guava occurs in California, Florida, and Hawaii. In Florida, the fruit ripens year-round, but the bulk of production occurs during the summer months. Guava may have first arrived in Florida from Cuba in 1847. Commercial production in the state began in 1912 (Morton 1987). Production took off in the 1980s, with acreage expanding from 35 acres to around 300 acres in 2000 (Degner et al. 2002). Estimates for 2015 put total guava production close to 600 acres, with the vast majority (> 90%) being grown in Miami-Dade County (J. Wasielewski, personal communication).



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There are many cultivars of guava, but they are usually categorized as pink/red or white. The pink guava varieties are popular in the Latin market in South Florida and are the ones with which people are most familiar. The white Thai guava variety, which is very popular in the Asian market, is beginning to expand into mainstream markets (Takele et al. 2007). The fruits are usually large in size, are harvested while the peel is still green, and are most often consumed while the fruit is firm (i.e., crunchy like an apple). Apart from the strong demand for the fruit among Asian communities, other factors which have contributed to the expansion in acreage of this crop include the fruit's quick, high yields and the fact that it is easily propagated and can be cultivated in a wide range of environmental and edaphic conditions owing to its tolerance to moisture stress and soil salinity (Singh 2007).

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Although returns from this crop variety are favorable, little information is readily available regarding the cost of production of this particular variety of guava. Hence the aim of this article is to provide estimates of the costs and returns associated with a representative five-acre Thai guava orchard.

Approach and Main Assumptions of Analysis

This analysis uses information gathered over the summer of 2013 from a combination of in-person and phone interviews with growers, state and county employees, University of Florida faculty and staff, and industry experts and suppliers. This analysis is a compilation of different cultural practices observed in guava production to estimate the cost of the establishment and production of a guava orchard to determine profitability for the grower. Readers interested in knowing more about the different cultural practices used in guava production may wish to read EDIS document HS4, *Guava Growing in the Florida Home Landscape*. (Crane and Balerdi 2013).

Land: Most of the growers in south Florida own, rather than rent, the land they use for production. Therefore, to represent the opportunity cost of growers using their own land for the production of guava, a rental cost of \$525 per acre is used in this analysis. Oftentimes this is not seen as an investment, but it must not be ignored since it is still an asset being used in production that could have been used to serve a different purpose. The budget and production cost items in this analysis are based on a five-acre orchard (the minimum size allowed for farming in Miami-Dade County, Florida).

Land Preparation: It is assumed that the land must be cleared/prepped for guava production; limestone bedrock makes up most of the land in south Florida and is not naturally conducive to farming without significant land preparation. After it is rock-plowed, the soil is disked to level out the land before creating mounds to plant the trees. Land preparation costs total \$5,115 per acre, which is 69% of the total variable cost in year one.

Variety: The white Thai guava is chosen because of its popularity for local production.

Orchard Layout: The cost of a new plant is determined to be around \$4, even if growers propagate the trees themselves (most commercially grown guavas are propagated through air layering or grafting to avoid variability). For commercial production of Thai guava, orchard spacing

varies from 3 to 10 feet between trees and 4 to 25 feet between rows (it is common to see denser spacing with more trees per acre for more intense production). Our representative orchard has a spacing of 8 feet between trees and 15 feet between rows (approximately 363 trees per acre).

Fertilization: Due to the poor quality of the soil, proper fertilization is very important in south Florida. Fertilizer treatments include applications of 20-20-20 in combination with 6-6-6, 8-16-16, or 8-3-9 fertilizer depending on the development stage of the plant. Chelated iron is also applied to the soil. A wide range of fertilizer practices are used. In this analysis, we use the averages of the frequency of application and amount applied on a per-tree basis. As a result, applications of fertilization and iron total \$354 and \$133 per acre per year, respectively (for more intense production these numbers may be much higher).

Weed Management: Weed control methods include the use of different herbicide products, usually a combination of a strong method, such as Liberty or Finale, in combination with a weaker method, so as to reduce the chance that weeds will develop resistance over time. Based on the average frequency and amount used due to different practices, the total cost of herbicides is estimated at \$212 per acre per year. The orchard is also mowed about 10 times a year, mainly during the rainy months, for a total estimated cost of \$120 per acre.

Pest Management: Due to the humid climate of south Florida, many pests attack guava orchards. Insecticides are used more heavily in the first year when the trees are just becoming established and beginning to fruit. Our estimate for a five-acre orchard is \$49 per acre for the first year. As the trees begin to fruit, a different practice specific to this variety is used, whereby each individual fruit is placed in a net and then bagged when it reaches about the size of a quarter. Once most of the fruit has been bagged, less insecticide is needed. In a full year of production (after the trees have been established), insecticide applications total \$17 per acre per year, and the cost of labor for bagging totals \$2,289 per acre. In this analysis, while there is no marketable yield in year one, about 10% of the fruit sold in year two is bagged in year one, so there is a cost incurred in year one for nets, bags, and labor (Table 1). The humid climate in the production area also creates a favorable environment for fungi, so fungicides are applied about three times a year for a total cost of \$74 per acre for each production year.

Irrigation: Micro-jetted irrigation systems are most commonly used in guava orchards. For our analysis, we assume that this type of irrigation system is operated by a 10-hp electric pump located near the power source. Crops are irrigated 2–3 times/week in the summer and winter months, depending on rainfall. Total estimated cost for irrigation is \$47 per acre (assuming a cost of 11.7 cents/kWh in Florida).

Wage Rates: The hourly wage rate for field workers is assumed to be \$11.00, and includes employer-contributed benefits (e.g., worker's compensation, social security, and Medicare taxes) and fringe benefits (e.g., health insurance). Bagging and harvesting rates supplied by the growers are used to calculate the labor costs. It is assumed that during an 8-hour workday, a worker can net and bag about 1,000 fruits per day, or can pick, sort, and pack about 500 pounds of fruit.

Harvesting and Marketing Costs: Guavas are picked by hand when mature. Because the fruit is bagged/netted, the harvest labor cost is increased. Harvested fruit is packed in waxed corrugated boxes to send to market. The total harvesting cost is estimated at about \$6,444 per production year, with an added \$2,123 for boxes.

Yields: Fruit starts appearing after the first six months. Some of these are bagged, but none are sold in the first year. For the second year, we estimate each tree to produce about 27 pounds of fruit (about 18 individual fruits). This takes into account that guava can be produced year-round, with more yield in summer than in winter. The model farm used in this analysis yields 9,801 pounds per acre of fruit in year two. In year three, the first year of full production, each tree produces about 108 pounds of fruit (about 22 individual fruits). The farm in this analysis produces 39,023 pounds of fruit per acre in a full production year, conditions permitting. A pack-out rate of 80% is assumed in order to account for the mix of fruits known as number one fruit (near perfect) and number two fruit (slight physical damage), implying a total marketable yield of 7,842 pounds per acre in year two and 31,218 pounds per acre in year three.

Guava Prices: Guava prices fluctuate depending on the season and the quality. During the summer, prices are lower due to the increase in supply and vice-versa in the winter. Therefore, prices range from \$0.50 per pound to \$2.00 per pound throughout the year. There are also observed differences in prices between number one fruit and number two fruit due to quality which ranges from \$0.25 to \$0.55 per pound. A weighted average is calculated with these ranges and an average price of \$0.95 is used in this analysis.

Interest on Pre-Harvest Costs: This reflects the costs of borrowing money or an opportunity cost for using equity. A nominal rate of 5% is used in the calculations.

Machinery and Equipment: Machinery and equipment charges are calculated based on the purchase price, the expected life of the asset, and a 5% interest rate. Capital recovery is calculated to show the amount of money that should be charged to the enterprise for the use of that asset to ensure that the value of the asset can be replaced at the end of its useful life. The capital recovery for the model farm is estimated at \$594 per acre per year.

Amortized Establishment Cost: In this analysis, it is assumed that the life of a productive guava orchard is twenty years. It should be noted that the first two years are considered establishment years. Therefore, in the analysis, the accumulated cost over the first two years is amortized over the remaining eighteen years of the orchard's life and is charged to the enterprise as a fixed cost with a value of \$737 per acre.

Accrued Interest on Establishment Costs: This represents the accruing charges on loans or returns used on equity during the establishment years. With a nominal interest rate of 5% being applied to the total cost for year one, the accrued interest is \$431 in year two.

Summary of Results

Based on the data collected and assumptions aforementioned, the estimated cost of establishing a guava orchard is about \$8,612 per acre (Table 1). Since there is marketable production in the second year, the accumulated establishment cost decreases slightly from \$8,619 per acre in the first year to \$8,612 per acre in the second year. The reason it only decreases by about \$7 is that there is some marketable yield in year two, which significantly increases the material and labor requirements. Therefore, whatever was gained from the sale of fruit in the second year is spent on increased labor and materials in the second year. Therefore, the cost of establishing a five-acre guava orchard is estimated to be \$43,060 (\$8,612 per acre), excluding any capital items purchased by the owner (Table 4). Since the guava orchard is in full production in the third year, the accumulated cost of establishment in the second year is amortized (at an annual interest rate of 5%) over the remaining eighteen years of life of the orchard. This amounts to an annual fixed expense of \$737 per acre charged against the enterprise in order to recoup the costs of establishing the orchard.

Annual growing costs and returns for a mature orchard are also summarized in the last column of Table 1 (Full Production Years). Based on the acquired information, it is assumed that guava reaches full production (maturity) in the third year. In a full production year, total growing cost increases to an estimated \$16,894, more than twice the cost (\$7,442) in the last year of establishment. This shows the impact that increasing yield has on production cost due to the increase in labor and materials.

The total cost of production attributed to the pre-harvest variable cost amounts to \$6,393, representing about 37.8% of the total production cost. This cost includes irrigation, chemicals, materials (nets and bags), labor, maintenance/repairs, and interest. Harvest and marketing costs are estimated at \$8,567, or 51% of the total cost. Therefore, the total variable cost is \$14,960, or 89% of the total cost of production. The remainder of the total cost is attributed to total fixed costs of \$1,934, which includes both cash overhead charges of \$603 (3%) and non-cash overhead charges of \$1,331 (8%). The fixed cost accounts for about 11% of the total cost of production. Assuming yields of 31,218 pounds per acre during full production years and total cost of \$16,893 per acre, the cost of producing Thai guava in south Florida is estimated at \$0.54 per pound.

Based on the assumed yield of 31,218 pounds per acre and the average market price of \$0.95 per pound, total receipts are estimated to be \$29,657 per acre. When the total cost of \$16,894 is deducted from the receipts, growers receive a net return of \$12,764 per acre. However, to break even, the orchard must be yielding and marketing a minimum of 17,783 pounds per acre at the assumed average price of \$0.95. Alternatively, if yield is assumed to be 31,218 pounds per acre, the minimum average price the grower would have to receive to just cover the production cost would be \$0.54 per pound; anything above this would result in positive net profit (Table 2). Table 3 shows the effects of price and quantity fluctuations on net returns. When the price declines below the breakeven price from the weighted average price, growers will be faced with a negative return. A sensitivity analysis shows that net returns from the production of Thai guava are more sensitive to a change in price than a change in yield. In other words, a 10% increase in price will have a far greater impact on net income than a 10% increase in yield.

Table 4 summarizes the total investment cost and the amount charged to the enterprise for a five-acre Thai guava orchard. This includes the cost of all capital items used in the operation (e.g., tractors, sprayers, lawn mowers, spreaders, golf carts, backpacks, and irrigation pumps),

which is \$25,900. The orchard establishment cost is \$43,062 (\$8,612 per acre multiplied by 5 acres). Therefore, total investment for a five-acre orchard is estimated at \$68,962 (Table 4). This investment cost excludes the cost of the land, since it was assumed that most farmers own the land. As mentioned earlier, a rental fee of \$525 per acre is charged to the operation to account for the opportunity cost of land. The investment cost also assumes that all capital items are bought new to be used solely for guava production and will be replaced at the end of their useful life. If used equipment were to be purchased, this would reduce the initial cost of investment, but it would increase the cost of maintenance and repairs.

Conclusions

Under the assumptions made in this analysis, the cost of establishing a five-acre Thai guava orchard in south Florida is \$43,062, or \$8,612 per acre. Total investment cost, comprising the purchase cost of capital items and the establishment and development, is estimated at \$68,962 (excluding the cost/value of land). The total cost of operating a mature Thai guava orchard from the third year onward is estimated at \$16,893 per acre. With an average price of \$0.95 per pound and a marketable yield of 31,218 pounds per acre, total revenue is estimated at \$29,657 per acre. This results in a gross margin (total revenue less total variable cost) of \$14,697 and net returns (total revenue less total cost) of about \$12,764 per acre. This implies that this investment is viable in the short run and has the potential to continue being profitable in the long run. This profitable venture compares to five times the net return on papaya and nine times the average net returns on mango and avocado.

With such profitable returns, Thai guava appears to be a viable option for growers in south Florida, though growers must keep in mind the nature of the industry. The market for the fruit can be regarded as thin, meaning that it can easily become oversaturated. With a sudden increase in supply, whether from domestic or international sources, prices will decrease substantially, making the operation unprofitable. Growers considering producing the crop are encouraged to proceed cautiously and not to engage in large-scale establishment.

References

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Table 1. Costs per acre of establishing and producing Thai guava on a five-acre orchard in south Florida.

Item	Unit	Establishment Years		Full Production Years
		Year 1	Year 2	
Estimated Yield	lbs/acre	0	7,841	31,218
Estimated Price	\$/lb	0	0.95	0.95
Total Receipts	Dollars	0	7,449	29,657
Site Preparation Cost:				
Clear land		1,500		
Rock plow		150		
Disk		35		
Build mounds		150		
Machinery transportation fee		300		
Irrigation (material, labor)		1,820		
Dig well		300		
Guava plants (363 plants/acre, \$4 per plant)		1,452		
Drill hole and plant		908		
Total Site Preparation	\$/acre	5,115		
Pre-Harvest Variable Cost:				
Irrigation	dollars	47	47	47
Fertilizer		337	354	354
Iron		120	133	133
Herbicide		207	212	212
Fungicide		51	74	74
Insecticide		49	17	17
Bags and nets		26	237	1,047
Mowing		120	120	120
Labor costs (pruning, fertilizing, etc.)		953	2,225	3,997
Irrigation repairs		0	20	40
All other repairs		49	49	40
Interest on pre-harvest costs		354	174	304
Total Pre-Harvest Variable Costs	\$/acre	2,312	174	
Harvesting:				
Picking, packing, and transporting		0	1,622	6,444
Boxes		0	533	2,123
Total Variable Costs	\$/acre	7,427	5,817	14,960
Annual Cash Fixed Costs:				
Property tax		74	76	78
Annual Non-Cash Fixed Costs:				
Land (rental price)		525	525	525
Irrigation equipment		108	108	108
Other machinery and equipment		486	486	486
Amortized establishment cost				737
Total Fixed Costs	\$/acre	1,192	1,195	1,934
Accrued Interest on Establishment		0	431	—
TOTAL COSTS	\$/acre	8,619	7,442	16,893
NET RETURNS	\$/acre	(8,619)	6	12,764
Accumulated Establishment Costs	\$/acre	8,619	8,612	

Table 2. Breakeven price and yield.

Item	Unit	Total
Breakeven price	\$/lb	\$0.54
Breakeven yield	lb	17,796

Table 3. Sensitivity analysis: Estimated net returns per acre at various prices and yield levels.

Price (\$/lb)	Yield (lbs/acre)				
	29,000	30,000	31,000	32,000	33,000
0.50	(1,536)	(1,423)	(1,309)	(1,196)	(1,082)
0.75	5,714	6,077	6,441	6,804	7,168
1.00	12,964	13,577	14,191	14,804	15,418
1.25	20,214	21,077	21,941	22,804	23,668
1.50	27,464	28,577	29,691	30,804	31,918
1.75	34,714	36,077	37,441	38,804	40,168
2.00	41,964	43,577	45,191	46,804	48,418

Table 4. Investment cost for five-acre guava orchard and annual per acre capital recovery.

Investment Inputs	Purchase Price*	Useful Life	Interest Rate	Capital Recovery
	(dollars)	(years)	(percent)	(\$/acre)
Tractor	12,000	12	0.05	271
Boom sprayer	4,000	10	0.05	104
Sit-on lawn mower	1,500	10	0.05	39
Broadcaster spreader	500	10	0.05	13
Golf cart	2,000	10	0.05	52
50-gal sprayer	200	10	0.05	5
5-gal backpack	100	10	0.05	3
Irrigation pump	5,600	15	0.05	108
Orchard establishment cost	43,062	18	0.05	737
Total investment for 5-acre orchard	68,962			1,330

*Excludes the cost of the land