

Summary of 2013/14 Production Costs for Indian River Fresh Market Grapefruit and Southwest Florida Juice Oranges¹

Fritz Roka, Ariel Singerman, and Ronald Muraro²

Acknowledgment

For more than 35 years, Ronald P. Muraro (professor, Food and Resource Economics Department, UF/IFAS) passionately served the Florida citrus industry. He was best known for publishing annual enterprise budgets for fresh grapefruit and juice oranges in the Indian River, Southwest, and Central/Ridge production regions of Florida. Ron developed an extensive network of growers and allied companies from which he compiled his budgets. He built his network not only in Florida, but also in Texas and California, as well as abroad in Brazil, Argentina, Mexico, South Africa, and Costa Rica. His thorough and comprehensive effort to collect accurate and representative cost data garnered him the utmost respect among citrus growers. More importantly, his information was trusted. Growers, bankers, property appraisers, government officials, industry leaders, university researchers, and anyone else who needed a reference for citrus cost of production viewed Ron's information as impeccable. Ron passed away on February 16, 2014, after a courageous stand against ALS. We dedicate this current version of Florida citrus enterprise budget to Ron's spirit and his abiding faith that the Florida citrus industry will remain strong in the face of any and all challenges.

Introduction

The primary purpose of enterprise budgets is to estimate typical costs in a given year for a particular crop and production region. Production managers and growers use published budgets as a reference against which to compare their costs and assist them in making cost-effective management decisions. Others who find value in enterprise budgets are property appraisers and bankers who use them to evaluate real estate sales and loan proposals, respectively. In addition, enterprise budgets provide researchers with data to examine the economic value of new technology and industry leaders with a basis on which to estimate overall economic impacts.

The budgets presented in this report summarize the cost of production for fresh market grapefruit grown in the Indian River region and juice oranges grown in Southwest Florida during the 2013/14 season. Production costs for fresh market fruit are higher than the production costs for juice fruit because more chemical sprays are required to maintain clean unblemished peels. Specific varieties are not considered to be important determinants of production cost. That is, we consider the costs to grow white and colored grapefruit varieties to be similar. Likewise, the costs

1. This is EDIS document FE968, a publication of the Food and Resource Economics Department, UF/IFAS Extension, Gainesville, FL. Published July 2015. Please visit the EDIS website at <http://edis.ifas.ufl.edu>.
2. Fritz Roka, associate professor, Food and Resource Economics Department, University of Florida, Southwest Florida Research and Education Center, Immokalee, FL, UF/IFAS Extension, Gainesville, FL. Ariel Singerman, assistant professor, Food and Resource Economics Department, University of Florida, Citrus Research and Education Center, Lake Alfred, FL, UF/IFAS Extension, Gainesville, FL. Ronald Muraro (in memoriam).

to grow early and late season juice oranges are assumed to be the same.

The greatest challenge facing Florida citrus growers during the 2013/14 season and now is citrus greening, a bacterial disease also known as Huanglongbing, or HLB. HLB clogs a tree's phloem and thereby starves its roots and canopy of essential nutrients. If HLB is left unchecked, yields from infected mature trees decline to levels that are not economically sustainable and young trees never reach full production. Infection is spread via the Asian citrus psyllid (ACP), which has been endemic throughout Florida since 1998 and whose populations growers did not attempt to control until late 2005 when HLB was first detected. To date, a cure has not been found for HLB. The initial recommendation to control the spread of HLB in 2005/06 was to eradicate symptomatic trees. Unfortunately, many Florida growers witnessed their HLB infection rates increase to levels where eradication would have meant the complete removal of their groves. Consequently, most growers made the economic decision to abandon the eradication approach and focus on horticultural practices, such as spraying foliar nutritional products, to maintain production from HLB-infected trees while a more permanent solution to HLB can be found.

More recently, citrus black spot (CBS) has appeared within commercial citrus groves. While CBS has been confined to Southwest Florida, the total area under quarantine has been expanding ever since the disease first appeared in 2010. Control strategies include using clean nursery stock for resets, application of fungicides, and managing leaf litter under the trees.

Study Approach

The methodology used in this report was similar to how Muraro compiled previous citrus enterprise budgets. The 2013/14 budgets for fresh grapefruit and juice oranges were developed through interviews with growers who managed their own citrus groves. Six fresh grapefruit growers and eight juice orange growers were interviewed in the Indian River and Southwest Florida regions, respectively. Information from twelve professional caretakers throughout the state provided custom rate charges for essential grove operations. The growers and caretakers who were interviewed shared a long-term commitment to survive HLB until permanent solutions (i.e., resistant varieties) can be found. Consequently, they have made substantial investments in their trees and groves. The production costs summarized in this report reflected the most current set of

cultural care practices that growers believe are necessary to remain economically viable.

During the interview process, growers described in detail their monthly grove operations—what materials were applied and the equipment used to apply those materials. Materials purchased for fruit production included (1) ground-applied fertilizer, including both dry and liquid materials; (2) foliar nutritional; (3) insecticides; (4) fungicides; and (5) herbicides. The growers described the frequency and the methods by which crop production materials were applied, including which products were applied as tank-mixes. Growers also provided information on pruning practices, irrigation costs, tree replacement or resetting costs, and costs related to fresh fruit inspections.

We calculated material costs by grower for each of the five cost categories listed above. Materials were applied at labeled rates and the quantities of individual products were totaled across the year. Product prices were taken from price sheets provided by chemical and fertilizer vendors. These prices did not include discounts growers typically negotiate from their chemical suppliers. These discounts ranged from 10% to 30%, depending on the type and quantities of each product being purchased, as well as other ongoing business relationships between the grower and the vendor. Application costs were estimated from a custom rate survey of professional citrus caretakers. Custom rate charges included a profit margin for the professional grove caretaker that a grower who operates his or her own equipment would not have to cover. While using published vendor prices and custom rate charges overstated actual costs, a uniform set of prices removed inconsistencies among growers in how they expensed their equipment and the extent to which individual operations negotiated product discounts. Applying a uniform set of product and equipment costs allowed us to focus on the differences in cultural programs among growers. Furthermore, because the same methodology was used as in previous years, the 2013/14 budget allowed us to gauge how costs have changed over time.

Production cost budgets during 2013/14 for fresh grapefruit and juice oranges in the Indian River and Southwest Florida are shown in Table 1. The budgets are organized into nine categories: (1) weed management, (2) foliar sprays, (3) ground fertilization, (4) pruning, (5) irrigation system, (6) pest scouting, (7) canker decontamination, (8) fresh fruit inspections and certifications, and (9) tree replacement. In each category, material and application costs are listed separately. The foliar spray program includes all insecticides, fungicides, and foliar nutritional materials.

The ground fertilizer program includes both dry-bulk and liquid fertilizer products.

Production Cost Analysis

Based on the specific products and field operations growers reported using, the cost to produce grapefruit for the fresh market reached \$3,028 per acre. Nearly 50% of these costs were spent on the foliar spray program. Weed management, including mowing operations, and ground fertilizer programs each were allocated 11% of the total annual production budget. Irrigation and tree replacement costs garnered 10% and 9% of annual costs, respectively. The balance of the budget was allocated to pest scouting, canker decontamination, and fresh fruit inspection costs.

Juice orange growers in Southwest Florida spent an estimated \$2,484 per acre to produce a crop of fruit. The foliar spray program received 38% of the allocated costs, while ground fertilizer and weed management programs received 20% and 16%, respectively, of the total production costs. The total cost of nutrients from both foliar and ground applications was close between Southwest Florida orange and Indian River grapefruit growers. Southwest Florida growers applied more nutrients via ground applications, while Indian River growers applied more nutrients through foliar sprays. The balance of the juice orange production cost budget went to tree replacement, irrigation system, pruning, and scouting. Juice orange growers did not incur fruit inspection and canker decontamination costs.

The costs listed in Table 1 represented direct cash costs related to fruit production. In previous years, these numbers corresponded to the first page of Muraro's budgets. "Page 2" of Muraro's budget included additional costs not directly related to production. These costs could be actual expenses or implied values that a grower must consider when evaluating the profitability of the citrus operation. For the 2013/14 season, property, water management, and drainage district taxes were considered cash expenses and were estimated to be \$150 per acre. These costs were close to the 2011/12 rates, they reflected the relatively small change in real estate values between 2011 and 2013. Grove management fees increased from \$48 (\$4/acre/month) in 2011 to \$60 per year (\$5/acre/month) in 2013. Management fees were charged by professional caretakers, categorized either as a direct cost or as an imputed value for those growers who manage their own groves. Interest charges on operating capital and interest on investment capital likewise were either the direct cash cost if the grove owner financed debt or the opportunity cost of growing citrus versus an alternative investment. In summary, these additional overhead expenses sometimes

increased overall costs by another 25%, or \$600 per acre, for both fresh market grapefruit and juice orange growers.

In Table 2, fresh grapefruit and juice orange growers' material costs were compared in five material categories: (1) ground-applied fertilizer, including both dry and liquid materials; (2) foliar nutritional; (3) insecticides; (4) fungicides; and (5) herbicides. Material costs for fresh market grapefruit growers were 12% more than for juice orange growers (\$1,506 versus \$1,332 per acre). Fresh grapefruit growers spent more for fungicides, foliar nutritional, and insecticides, while juice orange growers spent more for ground fertilizer and herbicide materials. The range in material costs for each category reflected differences among growers in the cultural care programs they implemented. Growers experimented with a variety of new products and grove practices to maintain fruit yields from HLB-infected trees at economically viable levels.

Growers in both the Indian River and Southwest Florida regions sprayed their groves on average 12 times during the year. Indian River grapefruit growers relied on ground equipment or air-blast sprayers to deliver the monthly sprays. Southwest Florida growers split their sprays between air-blast sprayer (8 times) and aerial applications of pest control and foliar nutritional products (Table 3). In both regions, there was a considerable range in the number of spray applications. The range among growers in the Indian River region was between 5 and 18 spray applications per year. In Southwest Florida, the range was between 5 and 12 spray applications per year. Many growers in Southwest Florida actively participated in the Citrus Health Management Areas (CHMAs), and at least two dormant-season spray applications were administered through the CHMAs (CHMAs are in the process of being established in the Indian River region). There was little difference between the two regions in terms of herbicide, bulk fertilizer, and mowing operations.

Between the 2012/13 and the 2013/14 seasons, production costs increased 30% and 34% for fresh grapefruit and juice oranges, respectively (Table 4). Since 2004, production costs for fresh grapefruit have increased 182%, while costs to grow juice oranges have increased 211%. Costs to grow either grapefruit or oranges in 2014 were nearly three times higher than what they were in 2004.

HLB has had a clear and significant impact on the cost of producing citrus. During the 2003/04 season (the pre-HLB era), grapefruit trees received six spray applications of primarily fungicides to produce market quality fresh fruit (Table 4). Eleven years later, the 2013/14 grapefruit budget

accounted for 12 spray applications, reflecting endemic HLB conditions. Similar increases in the number of foliar spray applications were found among juice orange growers. In the 2003/04 season, juice orange growers typically applied only two summer oil spray applications. In the 2013/14 season, juice oranges budget included the costs of 12 separate spray applications to control psyllid populations and to apply foliar nutritionals. The actual number of spray applications by individual growers in both the Indian River and Southwest regions ranged between 10 and 18 times a year.

Research has shown that high bicarbonate levels in irrigation water increases stress to HLB-infected trees by increasing soil pH, thereby lowering nutrient availability. Many growers have responded by adding acidifying products to their irrigation system in an attempt to counteract high bicarbonates and lower soil pH. These water treatment products have increased the irrigation cost component from \$50 to \$75 per acre (Table 1).

Profitability Analysis

Break-even prices to recover production costs for fresh market grapefruit and juice oranges are shown in Table 5 for yields ranging from 200 to 450 boxes per acre. A fruit price less than the break-even price would indicate that a grower is not recovering his/her cost of production, much less his/her investment to remain profitable in the long term. Break-even prices are calculated taking into account the production costs reported in Table 1, as well as harvest, fruit hauling, and Florida Department of Citrus (FDOC) assessment costs.

A fresh market grapefruit grower would compare values in Table 5 against the weighted average price he/she received from packed cartons sold to the fresh market and the value of grapefruit sold as juice eliminations. As shown in Table 5, the average on-tree price for all grapefruit grown during the 2013/14 season was \$6.44 per 85-pound box, with 43% of the crop being sold through the fresh market and 57% being sold as juice (FDACS 2015). Based on growing costs of \$3,028 per acre and a 40% pack-out for the fresh market, grapefruit growers would have needed to produce at least 470 boxes per acre to break even during the 2013/14 season.

During the 2013/14 season juice orange growers received an average on-tree price of \$7.58 per 90-pound box (FDACS 2015). This implied a break-even production level of 328 boxes per acre. Juice orange growers, however, were paid on the basis of delivered-in pound-solids. Assuming pound-solids of 6.25 per box, and harvesting, hauling, and

FDOC costs of \$2.60, \$0.75, and \$0.23 per box, respectively, a grower harvesting 200 boxes per acre would have to have earned at least \$2.56 per pound-solid to recover an estimated growing cost of \$2,484 per acre. As his/her yield increases to 450 boxes per acre with the same level of pound-solids and harvest/FDOC costs, the grower's break-even price decreases by more than a dollar, to \$1.46 per pound-solid.

Summary Comments

This report outlines the cost of production budgets for fresh grapefruit and juice oranges grown during the 2013/14 season. For two reasons, the cost estimates reported are acknowledged to be higher than what most citrus growers likely are spending. First, material costs are based on vendors' list prices and do not account for any discounts that individual growers may be able to negotiate. Second, the budgets shown in this report reflect the cultural care programs that growers currently believe will be successful against citrus greening/HLB.

The Florida citrus industry is on a steep learning curve as it collectively tries to maintain economically sustainable fruit yields from HLB-infected trees. Growers are experimenting with new materials and management strategies to reduce psyllid populations and improve a tree's overall nutritional health. As a result, production costs have increased three-fold since 2004. As new research into HLB and psyllid management evolves, new products and practices may prove to be more cost effective.

References

Florida Department of Agriculture and Consumer Services (FDACS). 2015. *Florida Citrus Statistics, 2013/14*. Tallahassee, FL: Florida Department of Agriculture and Consumer Services.

Muraro, R.P. 2005. *Summary of 2003/04 Citrus Budget for the Indian River Production Region*. <http://www.crec.ifas.ufl.edu/extension/economics/pdf/IndianRiverSum04.pdf>

Muraro, R.P. 2005. *Summary of 2003/04 Citrus Budgets for the Southwest Florida Production Region*. <http://www.crec.ifas.ufl.edu/extension/economics/pdf/SouthwestFlorida-Sum04.pdf>

Muraro, R.P. 2013. *Summary of 2011/12 Citrus Budget for the Indian River Production Region*. <http://www.crec.ifas.ufl.edu/extension/economics/pdf/IR%20Budget%20Summary%202011-2012.pdf>

Muraro, R.P. 2013. *Summary of 2011/12 Citrus Budgets for the Southwest Florida Production Region*. <http://www.crec.ifas.ufl.edu/extension/economics/pdf/SW%20FLA%20Budget%20Summary%202011-2012.pdf>

Table 1. Citrus production costs for fresh market grapefruit and juice oranges in the Indian River and Southwest Florida regions, 2013/14^z

Grove Activity Category	Fresh Grapefruit	Juice Oranges
Weed Management		
Application cost	\$60	\$45
Herbicide material cost	\$147	\$231
Mow (6/year)	\$78	\$78
General grove labor (2 hr/acre)	\$40	\$40
Total Weed Management (\$/acre)	\$325	\$394
Foliar Spray		
Application cost	\$420	\$284
Pest material cost (insecticide & fungicide)	\$654	\$416
Nutritionals	\$423	\$243
Total Foliar Spray (\$/acre)	\$1,497	\$943
Ground Fertilizer		
Application cost	\$30	\$40
Fertilizer cost	\$281	\$443
Dolomite	\$19	\$19
Total Ground Fertilizer (\$/acre)	\$330	\$502
Pruning (\$/ac)	\$59	\$45
Irrigation System		
Fuel/repairs/depreciation	\$160	\$160
Ditch maintenance/water control	\$60	\$60
Water treatment (acid pH)	\$75	\$50
Total Irrigation (\$/acre)	\$295	\$270
Scouting / Psyllid (\$/acre)	\$55	\$55
Canker decontamination costs (\$/acre)	\$32	\$0
Inspections and certification		
Canker	\$100	\$0
Fly protocol	\$60	\$0
Total Inspections & Certification (\$/acre)	\$160	\$0
Tree Replacement (5 tpa-year)		
Removal	\$60	\$60
Site Prep and Replant	\$65	\$65
Reset Care (1–3 years of age)	\$150	\$150
Total Tree Replacement (\$/acre)	\$275	\$275
Total Grove Care Costs	\$3,028	\$2,484

^zThe listed costs were compiled from interviews of growers whose long-term goal is to remain viable until more permanent solutions for HLB can be found. Costs represent product vendors' list prices and do not take into account any discounts to individual growers.

Table 2. Average (avg) annual material costs by cost category for fresh grapefruit and juice oranges in the Indian River and Southwest Florida regions, 2013/14²

Cost category	Fresh Grapefruit	Juice Oranges
	Avg \$/acre (min–max)	Avg \$/acre (min–max)
Ground fertilizer	\$281 (227–426)	\$443 (318–591)
Foliar nutritional	\$423 (305–622)	\$243 (69–408)
Insecticide	\$369 (258–476)	\$271 (91–458)
Fungicide	\$285 (145–419)	\$145 (128–193)
Herbicide	\$147 (38–275)	\$231 (164–422)
Material costs	\$1,506	\$1,332

²Minimum and maximum costs (min– max) indicate the range in what individual growers spent in each category
 Source: Material names and quantities compiled from grower interviews. Products valued at list prices provided by chemical and fertilizer vendors.

Table 3. Custom rate charges by field operations and average (avg) number of trips per year during 2013/14 for fresh grapefruit and juice orange growers in the Indian River and Southwest Florida regions^z

Field Operations	Cost per trip \$/acre	Fresh Grapefruit	Juice Oranges
		Avg trips/year (min–max)	Avg trips/year (min–max)
Air-blast sprays (125 gpa)	\$35/acre	12 (5–18)	8 (5–12)
Aerial sprays	\$7/acre	0 (0–1)	4 (0–7)
Spread dry fertilizer	\$10/acre	3 (2–4)	4 (3–5)
Herbicide spray	\$15/acre	4 (3–4)	3 (2–5)
Mow	\$13/acre	4 (3–6)	3 (2–3)
Chemical mow	\$10/acre	2 (0–4)	2 (0–4)
Application costs		\$634	\$423

^z Minimum and maximum (min–max) indicate the range in application trips per acre among individual growers.
Source: 2014 Survey of professional grove caretaking companies.

Table 4. Comparison of production costs over time for fresh grapefruit and juice oranges

Fresh Grapefruit – Indian River	2004^z	2012^z	2014
Weed management	\$192	\$236	\$325
Foliar spray program	\$348	\$1,038	\$1,497
Ground fertilizer	\$116	\$328	\$330
Pruning	\$42	\$48	\$59
Irrigation system	\$193	\$215	\$295
Scouting for psyllids	\$0	\$55	\$55
Canker decontamination costs	\$6	\$32	\$32
Inspections and certification	\$55	\$146	\$160
Tree Replacement (5 tpa-year)	\$129	\$229	\$275
Total Grove Care Costs	\$1,075	\$2,327	\$3,028
Juice Oranges – Southwest Florida	2004^x	2012^x	2014
Weed management	\$166	\$204	\$394
Foliar spray program	\$132	\$665	\$943
Ground fertilizer	\$147	\$410	\$502
Pruning	\$28	\$37	\$45
Irrigation system	\$193	\$216	\$270
Scouting for psyllids	\$0	\$55	\$55
Canker decontamination costs	\$5	\$32	\$0
Inspections and certification	\$0	\$0	\$0
Tree Replacement (5 tpa-year)	\$104	\$229	\$275
Total Grove Care Costs	\$775	\$1,848	\$2,484

^z Muraro (2005, 2013).

Table 5. Break-even prices by fruit yield to cover production costs for fresh market grapefruit and juice oranges in Indian River and Southwest Florida regions, respectively, 2013/14

		Box Yield per Acre					
		200	250	300	350	400	450
Fresh Market Grapefruit	On-tree: \$/box	15.14	12.11	10.09	8.65	7.57	6.73
Total costs: \$3,028/acre							
Juice Oranges	On-tree: \$/box	12.42	9.94	8.28	7.10	6.21	5.52
	Deliver-in: \$/p.s.	2.56	2.16	1.90	1.71	1.57	1.46
Total costs: \$2,484/acre							
Avg pound-solids: 6.25							
Pick and roadside: \$2.60/box							
Haul: \$0.75/box							
FDOC assessment: \$0.23/box							