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Economic Information  
Report 98-1

# Factors Affecting Efficiency In Florida Fresh Citrus Packinghouses, 1995-96



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## ABSTRACT

A Florida fresh citrus packing efficiency cost study for the 1995-96 season was conducted from January 1997 to August 1997. A total of 14 commercial citrus packers--8 from the Interior region and 6 from the Indian River area--provided packing cost data for the study. These 14 packers accounted for 26.9% of the total Florida fresh packed citrus during the season reported. A summary of the estimated average comparative packing costs per 4/5 bushel carton for the Interior and Indian River regions is presented. The average cost per 4/5 carton for the Interior and Indian River was \$3.53 and \$4.10, respectively. The statewide average cost for all packers was \$3.74 per 4/5 carton.

Key words: Florida citrus packing costs, fresh fruit, packing charges, harvesting costs.

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## TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT .....	i
ACKNOWLEDGMENTS .....	i
LIST OF TABLES .....	iii
INTRODUCTION .....	1
RESULTS .....	1
REFERENCES .....	8
ADDENDA .....	9

## LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Summary of packers by volume of cartons packed, 1995-96 season — all participating packers . . . . .	2
2	Summary of fruit volume handled through packinghouses, 1995-96 season — all participating packers . . . . .	2
3	Average volume of fruit handled by packinghouses, 1995-96 season . . .	3
4	Summary of packed fruit by type of container, 1995-96 season — all participating packers . . . . .	4
5	Estimated per carton packing costs for packinghouses, 1995-96 season .	5
6	Average of mean efficiency and range of efficiency for packinghouse in cost study — 1995-96 season . . . . .	6
7	Average of mean labor cost and range of labor cost as a percentage of total cost for packinghouses in cost study — 1995-96 season . . . . .	7

# FACTORS AFFECTING EFFICIENCY IN FLORIDA FRESH CITRUS PACKINGHOUSES, 1995-96 SEASON<sup>1</sup>

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## INTRODUCTION

The lower returns experienced by Florida's fresh citrus industry in recent years has raised the need for current information to evaluate the cost efficiency of commercial fresh citrus packers. The Florida Department of Citrus in 1996, funded a cost efficiency study for Florida's fresh citrus packinghouses. The cost study was for a two-year duration. This report summarizes the second year results of the cost efficiency study.

This research involved collecting data from packinghouses operating in Florida and analyzing the efficiency of their operations. All packinghouses were contacted to collect data needed to calculate packinghouse efficiency. A total of 50 packinghouses were contacted to provide data on the 1995-96 packing season. Data were received from 14 packinghouses; 8 from the Interior and 6 from the Indian River citrus production regions. This compares with a total of 10 packers in year one of this project. The 14 packers accounted for 26.9% of the total citrus packed in Florida during the 1995-96 season. By variety, the 14 packers accounted for the following percentages of citrus packed in 1995-96 season: 36.5% of oranges and temples; 22.2% of grapefruit; 32.7% of tangelos; and 31.0% of tangerines. A size distribution of packers by volume of fruit packed is shown in Table 1.

## RESULTS

A total of 15.151 million field boxes were received/handled by the packers in the survey (Table 2). The average volume of the Interior packinghouses was 1.112 million field

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<sup>1</sup>This research project was funded by the Florida Department of Citrus.

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boxes received with 0.719 million field boxes packed as fresh citrus (Table 3). The average volume of the Indian River packinghouses was 1.043 million field boxes received with 0.580 million boxes packed as fresh citrus. There was more diversity of varieties handled by the Interior packinghouses; 92% of the fruit was comprised of oranges, grapefruit and tangerines. Whereas, grapefruit accounted for 92% of the total fresh citrus packed in the Indian River packinghouses.

Table 1.--Summary of packers by volume of cartons packed, 1995-96 season — all participating packers<sup>a</sup>

Total cartons packed	Interior packers	Indian River packers	All packers
1,000 4/5 bu. carton equivalents			
500.0 - 999.9	2	2	4
1,000.0 - 1,499.9	3	2	5
Greater than 1,500.0	3	2	5
Total packers	8	6	14

<sup>a</sup>Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

Table 2.--Summary of fruit volume handled through packinghouses, 1995-96 season — all participating packers<sup>a</sup>

Variety	Total fruit received	Fruit packed	Cannery eliminations	Percent packout
	----- 1,000 field box equivalents -----			
Oranges	4,928.7	3,087.6	1,841.1	62.6%
Grapefruit	8,202.5	4,711.6	3,490.9	57.4%
Temples	372.2	237.2	135.0	63.7%
Tangelos	403.7	267.8	135.9	66.3%
Tangerines	1,244.0	928.1	315.9	74.6%
Total fruit	15,151.1	9,232.3	5,918.8	60.9%

<sup>a</sup>Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouse) and Interior (8 packinghouses) producing regions.

Table 3.--Average volume of fruit handled by packinghouses, 1995-96 season<sup>a</sup>

Variety	Total fruit received	Fruit packed	Cannery eliminations	Percent packout
----- 1,000 field box equivalents -----				
<b><u>Interior</u></b>				
Oranges	576.1	356.8	219.4	61.9%
Grapefruit	302.6	198.4	104.2	65.6%
Temples	44.5	28.1	16.3	63.3%
Tangelos	45.1	29.2	15.8	64.9%
Tangerines	143.3	106.2	37.0	74.1%
Total fruit	1,111.6	718.8	392.8	64.7%
<b><u>Indian River</u></b>				
Oranges	53.3	38.9	14.4	73.0%
Grapefruit	963.6	520.7	442.9	54.0%
Temples	2.7	2.0	0.7	73.2%
Tangelos	7.2	5.7	1.5	78.7%
Tangerines	16.3	13.0	3.3	80.0%
Total fruit	1,043.1	580.3	462.8	55.6%

<sup>a</sup>Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

The average percent packout for all packinghouses was 60.9% indicating that 39.1% were eliminations, not packed as fresh fruit. The average percent packout for the Interior packers was 64.7% compared to 55.6% for the Indian River packers. The dominance of grapefruit packed for the export market was the major factor lowering the average packout percentage for the Indian River packers. The foreign buyers demand a superior, blemish free appearance and more selective fruit sizes which requires handling a larger volume of fruit to meet their market standards.

A summary of packed fruit by type of container for all packers participating in the cost study is shown in Table 4. A total of 18.672 million 4/5 bushel equivalent cartons were packed which represented 26.9% of the total Florida fresh citrus packed during the 1995-96



season. A total of 14.542 million standard cartons, which includes both domestic (10.127 million) and export (4.415 million) cartons, accounted for over 77.9% of the total cartons packed. The Indian River area packed over 81.8% of the total export cartons consisting almost entirely of grapefruit. Bag master containers represented 16.4% or 3.066 million cartons packed. The remaining 1.064 million packed cartons consisted of 2/5 bushel gift fruit cartons (2.4%) and bulk fruit shipped in pallet boxes and bins (3.3%).

Table 4.--Summary of packed fruit by type of container, 1995-96 season — all participating packers\*

Variety	2/5 bu cartons	4/5 bu cartons std	Bag master containers	Bulk in pallet boxes and bins	Total cartons packed
	----- 1,000 4/5 bushel equivalents -----				
Oranges	191.2	3,606.6	1,985.0	372.6	6,155.4
Grapefruit	209.6	8,500.6	723.8	213.7	9,647.7
Templets	4.1	454.5	21.0	3.9	483.5
Tangelos	37.5	381.8	104.7	4.4	528.4
Tangerines	3.5	1,598.3	231.7	23.5	1,857.0
Total fruit	445.9	14,541.8	3,066.2	618.1	18,672.0

\*Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

The cost of operating the packinghouses varied between producing regions and within producing regions. The per unit average total of all costs for packing fresh citrus varied between the Interior and Indian River producing regions, averaging \$3.53 per 4/5 bushel carton in the Interior and \$4.10 per 4/5 bushel carton in the Indian River (Table 5). The total cost of operating the packinghouses ranged from \$3.07 to \$4.20 per 4/5 carton in the Interior and from \$3.79 to \$4.47 in the Indian River region. The total of all costs for all packers averaged \$3.75 per carton with a range of \$3.07 to \$4.47 per carton.

Table 5.--Estimated per carton packing costs for packinghouses, 1995-96 season<sup>a</sup>

Item	Interior	Indian River	All packers
	----- \$ per 4/5 bushel carton -----		
Production cost:			
Materials <sup>b</sup>	\$1.0573	\$1.1628	\$1.0968
Labor <sup>c</sup>	0.8811	1.1219	0.9715
Other direct packing costs <sup>d</sup>	0.5307	0.5545	0.5396
Indirect packing costs <sup>e</sup>	<u>0.2768</u>	<u>0.3682</u>	<u>0.3111</u>
Total production costs	\$2.7459	\$3.2074	\$2.9190
Selling expense	0.2489	0.2716	0.2574
General and administrative costs <sup>f</sup>	<u>0.3038</u>	<u>0.3515</u>	<u>0.3217</u>
Total packing costs	\$3.2986	\$3.8305	\$3.4981
Special assessments <sup>g</sup>	<u>0.2357</u>	<u>0.2711</u>	<u>0.2490</u>
Total all costs	<u>\$3.5343</u>	<u>\$4.1016</u>	<u>\$3.7471</u>
Range	\$3.07 - \$4.20	\$3.79 - \$4.47	\$3.07 - \$4.47

<sup>a</sup>Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

<sup>b</sup>Includes mesh/plastic bags, labels/PLUs, etc.

<sup>c</sup>Includes supervisor/foreman labor, grading, palletizing, shipping and general labor. Includes payroll taxes (FICA), workers' compensation, group insurance, etc.

<sup>d</sup>Other direct packing costs include: fruit treating; power, lights and water; repair/maintenance; miscellaneous supplies, etc.

<sup>e</sup>Indirect packing costs include such items as: insurance-fire and casualty; taxes and licences, depreciation and rent.

<sup>f</sup>G&A costs include: office personnel (FICA, w/comp); packinghouse and general manager; office suppliers; telephone, etc.

<sup>g</sup>Special assessments include such items as: advertising taxes, inspection fees, Florida Citrus Packers; CAC.

Efficiency, as a concept, is built on the premise of determining the best combination of resources operating at the optimum scale which produces a bundle of goods with the least expense possible. The cost efficiency of packing fresh citrus for the fresh market assumed that one firm is operating at 100% efficiency. Thus, efficiency is estimated here as the proximity of the firm to the least cost firm in operating costs per unit cost basis. The firm operating at the lowest per unit cost was defined as 100% efficient and the deviation from the lowest firm's per unit cost for other firms was defined as inefficiency. A production function could not be estimated because of lack of sufficient data to estimate the regression equation necessary to define efficiency. Estimating efficiency of packing using per unit costs provides a second method that does approach a true measure of efficiency.

Following these procedures, efficiency was measured for the 14 participating firms in this study. The results presented in Table 6 indicate that average efficiency of the firms in the study is 68.5% when compared to a 100% efficient cost of \$3.07 per 4/5 bushel carton. Further comparison shows the Interior packinghouses operated more efficiently than firms in the Indian River region, 76.0% to 56.1%, respectively. However, when comparing cost efficiency within regions, the Indian River region had a higher average cost efficiency rating (91.8%) than the Interior (76%). This may be due to the fact that a single citrus variety, grapefruit, represented over 92% of the total citrus packed in the Indian River region.

Table 6.--Average of mean efficiency and range of efficiency for packinghouse in cost study — 1995-96 season\*

Production region	Average	Low range	High range
----- % efficiency of packinghouses -----			
Interior packers	76.0%	52.6%	100.0%
Indian River packers	56.1%	43.2%	66.9%
All packers	68.5%	43.2%	100.0%
-----			
Indian River packers compared within region	91.8%	82.1%	100.0%

\*Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

An analysis of factors contributing to efficiency found those firms operating in the Interior region increased their efficiency with higher packout (Table 3) and lower labor costs (Table 7); however, no relationship was measured between packout and labor costs with efficiency in the Indian River region. The cost of labor for all packers averaged 25.9% of total costs (Table 7). The average labor costs as a percentage of total costs for both the Interior and Indian River packers were similar, 24.9% and 27.4%, respectively. The lowest percentage labor cost was in the Interior (18.5%) and the highest in the Indian River (35.4%).

Table 7.--Average of mean labor cost and range of labor cost as a percentage of total cost for packinghouses in cost study — 1995-96 season<sup>a</sup>

Production region	Average	Low range	High range
	----- % labor cost of total cost -----		
Interior packers	24.9%	18.5%	30.4%
Indian River packers	27.3%	22.6%	35.4%
All packers	25.9%	24.9%	35.4%

<sup>a</sup>Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

A lack of response to the survey limited the analysis of efficiency to a discussion of costs related to packing fresh citrus. As new technologies are developed to improve efficiencies in growing and packing fresh citrus, it becomes vitally important to expand the base on which this study was completed. Future cost efficiency studies for Florida's fresh citrus industry should encourage more firms to participate so that a production function can be estimated for measuring efficiency. Using per unit costs as a proxy for measuring efficiency serves a useful purpose, but developing a production function would be more theoretically correct.

## REFERENCES

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## ADDENDA

Three tables are listed in the ADDENDA of this report. Table 1-A shows charges for several items involving the handling of fresh packed citrus. Table 2-A harvesting charges for picking, roadsiding and hauling Florida citrus. The estimated costs per box for harvesting (pick, roadside and haul) Florida citrus by hauling distance is shown in Table 3-A. The tables in the ADDENDA were included to provide additional information for the reader/user of this report.

ADDENDA TABLE 1-A.--Summary of Florida fresh citrus packing charges by variety — 1995-96  
season<sup>a</sup>

	Grapefruit		Oranges/Temples	Tangerines	Tangelos
	Domestic	Export			
	----- \$ per 4/5 carton -----				
Total packing	2.998	3.068	3.303	4.080	3.502
Label/PLU charges	0.134	—	0.174	0.193	0.174
Export handling charges	—	0.733	—	—	—
Eliminations charges per field box <sup>b</sup>	0.578	0.472	0.562	0.576	0.569
Drenching charges per field box	0.147	0.147	0.147	0.147	0.147
Fly free charges per	—	0.550	—	—	—

<sup>a</sup>Represents data from 14 fresh citrus packinghouses located in the Indian River (6 packinghouses) and Interior (8 packinghouses) producing regions.

<sup>b</sup>Add \$0.35 per box charge for short haul distance to processing plant and up to \$0.60 per box for 100+ miles hauling distance.

ADDENDA TABLE 2-A.--Estimated average picking, roadsiding and hauling rates for Florida citrus — 1995-96 season<sup>a</sup>

Variety	Fresh	Processing	State average
<b>Picking:</b> ----- \$ per Florida field box-----			
Early/Midseason oranges	0.792	0.741	0.771
Valencia oranges	0.803	0.758	0.728
Pink/Red grapefruit	0.606	0.574	0.592
White grapefruit	0.624	0.579	0.604
Temples	0.847	0.771	0.816
Tangelos	1.079	0.897	1.008
Tangerines	1.668	1.213	1.466
<b>Roadsiding:</b> ----- \$ per Florida field box-----			
Early/Midseason oranges	0.824	0.784	0.805
Valencia oranges	0.834	0.804	0.819
Pink/Red grapefruit	0.722	0.682	0.704
White grapefruit	0.770	0.739	0.756
Temples	0.825	0.773	0.802
Tangelos	0.904	0.839	0.875
Tangerines	1.108	0.954	1.039
<b>Hauling (All citrus):</b> ----- \$ per Florida field box-----			
(Mileage Range)			
0-30 miles	0.347	0.348	0.348
31-50 miles	0.403	0.406	0.405
51-80 miles	0.479	0.499	0.489
81-100 miles	0.521	0.546	0.533
100+ miles	0.570	0.599	0.585

<sup>a</sup>Harvesting rates from a mail-in survey conducted. Although, the total survey respondents represented less than 10% of the total fruit harvested in the 1995-96 season, review of the harvesting rates data by industry sources indicate that the averages reported are representative for the 1995-96 harvest season.



ADDENDA TABLE 3-A.--Estimated total harvesting (pick/roadside/haul). Costs per box for Florida citrus — 1995-96 season<sup>a</sup>

Variety/Hauling range	Fresh	Processing	State average
<u>Early/Midseason oranges</u> ----- \$ per Florida field box -----			
0-30 miles	1.957	1.867	1.918
31-50 miles	2.012	1.924	1.973
51-80 miles	2.088	2.016	2.057
81-100 miles	2.128	2.062	2.100
100+ miles	2.179	2.116	2.153
State average	2.053	1.975	2.019
-----			
<u>Valencia oranges</u> ----- \$ per Florida field box -----			
0-30 miles	1.978	1.903	1.942
31-50 miles	2.033	1.960	1.997
51-80 miles	2.108	2.052	2.082
81-100 miles	2.149	2.098	2.124
100+ miles	2.200	2.152	2.177
State average	2.074	2.011	2.044
-----			
<u>Red grapefruit</u> ----- \$ per Florida field box -----			
0-30 miles	1.670	1.598	1.638
31-50 miles	1.724	1.655	1.693
51-80 miles	1.800	1.748	1.777
81-100 miles	1.840	1.793	1.820
100+ miles	1.891	1.848	1.873
State average	1.763	1.703	1.736
-----			
<u>White grapefruit</u> ----- \$ per Florida field box -----			
0-30 miles	1.734	1.661	1.701
31-50 miles	1.789	1.717	1.757
51-80 miles	1.865	1.810	1.841
81-100 miles	1.905	1.855	1.884
100+ miles	1.956	1.910	1.937
State average	1.825	1.762	1.797
-----			
<u>Tangelos</u> ----- \$ per Florida field box -----			
0-30 miles	2.342	2.097	2.243
31-50 miles	2.402	2.158	2.303
51-80 miles	2.477	2.251	2.388
81-100 miles	2.522	2.300	2.434
100+ miles	2.569	2.351	2.483
State average	2.440	2.205	2.346
-----			
<u>Tangerines</u> ----- \$ per Florida field box -----			
0-30 miles	3.134	2.527	2.864
31-50 miles	3.194	2.588	2.925
51-80 miles	3.270	2.681	3.009
81-100 miles	3.314	2.730	3.056
100+ miles	3.361	2.781	3.105
State average	3.232	2.636	2.968

<sup>a</sup>Harvesting rates from a mail-in survey conducted. Although, the total survey respondents represented less than 10% of the total fruit harvested in the 1995-96 season, review of the harvesting rates data by industry sources indicate that the averages reported are representative for the 1995-96 harvest season.