ECONOMIC IMPACT OF FLORIDA'S CITRUS INDUSTRY, 1999-2000

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Economic Information Report 01-2

July 2001

UNIVERSITY OF FLORIDA

Table of Contents

List of Tables

List of Figures

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Revised July 30, 2001

Abstract

The citrus industry in Florida has historically been an important sector of the state's agricultural economy, and remains so today. Citrus fruits, including oranges, grapefruit, tangelos, tangerines, limes, and other specialty fruits, are the state's largest agricultural commodity. Florida is the world's leading producing region for grapefruit and second only to Brazil in orange production. The state produces over 80 percent of the United States' supply of citrus. Production of citrus in Florida has increased substantially over the past 10 years, as a result of large replantings following the disastrous freezes during the mid-1980's. In the 1999-2000 season, a total of 298 million boxes of citrus fruit were produced in Florida from 107 million bearing citrus trees growing on 832,000 acres. The farm-level value of citrus fruit sold to packinghouses and processing plants amounted to $1.73 billion. Nearly 90 percent of Florida citrus is processed into canned, chilled, and frozen concentrate juices. Total industry output was $4.07 billion, including $3.58 billion in sales of citrus juice and processed citrus byproducts, and $494 million in sales of fresh citrus fruit. About 93 percent of Florida citrus products, valued at $3.89 billion, were shipped to domestic and international markets outside the state. Income to the regional economy from export sales results in secondary economic impacts. These impacts , which were evaluated with *Implan*, an input-output modeling and social accounting system that was used to develop a regional economic model for the state of Florida. Total economic impacts associated with the citrus industry were estimated at $9.13 billion in industry output, $4.18 billion in value added, and 89,700 jobs. This included an indirect impact of $2.13 billion in output attributed to purchases from other industry sectors, and an induced impact $2.93 billion resulting from consumer spending of earnings by industry employees.

Keywords: citrus, Florida, economic impact, *Implan*, multiplier, sales, employment, value added, fruit, juice, oranges, grapefruit.

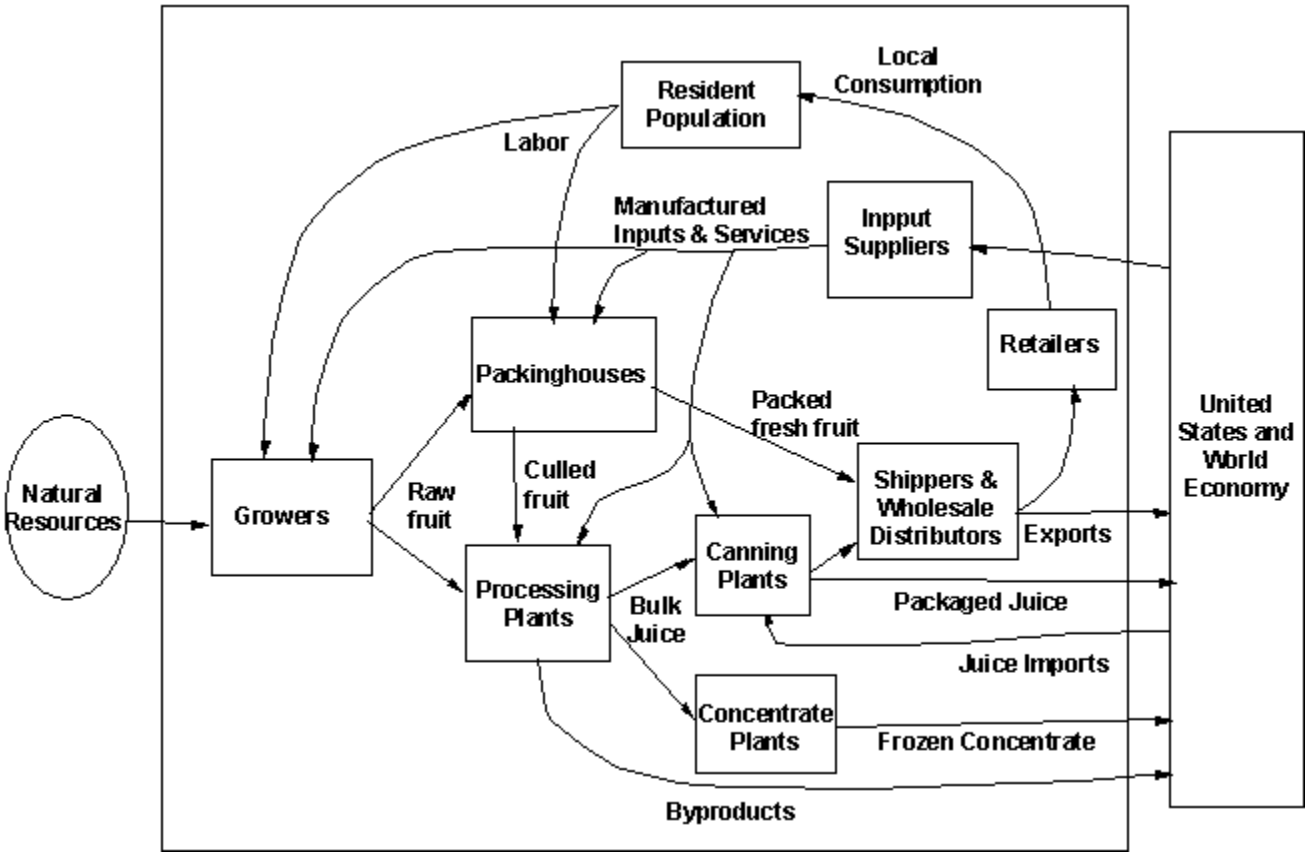
Acknowledgments

Funding for this project was provided by the Florida Department of Agriculture and Consumer Services. Assistance was provided by Robert Barber, Economist, Florida Citrus Mutual. Technical peer reviews of the draft manuscript were provided by Mark Brown and Jonq-Ying Lee of the Florida Department of Citrus.

Structure of the Florida Citrus Industry

The economic structure of the Florida citrus industry is illustrated in Figure 1. Florida growers produce a variety of citrus fruits such as oranges, grapefruit, temples, tangerines, tangelos, limes, and lemons. The environment of Florida provides a comparative advantage for citrus production due to natural resources such as the subtropical climate and abundant water. Citrus is marketed either as fresh fruit or is processed into juice products. Fruit sold for the fresh market is hauled to packinghouses where it is graded and packed, then shipped to terminal points for distribution to retailers such as grocery stores. Culled fruit not meeting grade for the fresh market is sold to processors. Citrus produced for the processed market is transported to processing plants for juice extraction. Bulk juice is moved to concentrate plants for evaporation and freezing into frozen concentrate or to canning plants for retail packaging. Bulk frozen concentrate juice is sold to plants outside Florida for reconstituting and packaging. Florida processors also import orange juice concentrate from Brazil, Mexico, Caribbean basin countries, and other citrus producing states in the United States. Retail packaged citrus juice products may be exported to distributors outside the state or sold to wholesalers in Florida and then to retailers for sale to consumers under a nationally advertised brand or private grocery chain label. As citrus products change form and move through market channels, value is added from labor, capital and management. The industry is linked to input supply businesses that provide fertilizers, chemicals, grove care services, packaging materials, transportation, etc, and labor for citrus production and processing is provided by Florida residents.

Figure 1. Economic structure of the Florida citrus industry.



Florida Citrus Producing Regions

Citrus has been produced commercially in Florida since the mid-1800's. It is produced across the southern two-thirds of the Florida peninsula, where there is a low probability of damaging winter freeze events, from Putnam County in the north to Miami-Dade County in the south. The four major citrus producing regions are the East Coast, Lower Interior, Upper Interior, and West Coast Districts (Figure 2). In 1957 citrus production was centered in the Upper Interior District, with 40 percent of total citrus production, followed by the Lower Interior (30%), West Coast (17%), and the East Coast (12%, Table 1). By 1999, the geographical distribution had shifted towards the Lower Interior District (61%), followed by the East Coast (24%), West Coast (8%), and the Upper Interior (6%). The southward migration of citrus production was a response to a series of freezes in the north central region of the state in the 1980s.

Table 1. Percent of Florida citrus production, by district, 1957, 1982, 1999.

District	1957	1982	1999
East Coast	12	26	24
Upper Interior	40	26	6
Lower Interior	30	37	61
West Coast	17	11	8

Sources: Jackson et al, 1989, Florida Agricultural Statistics Service.

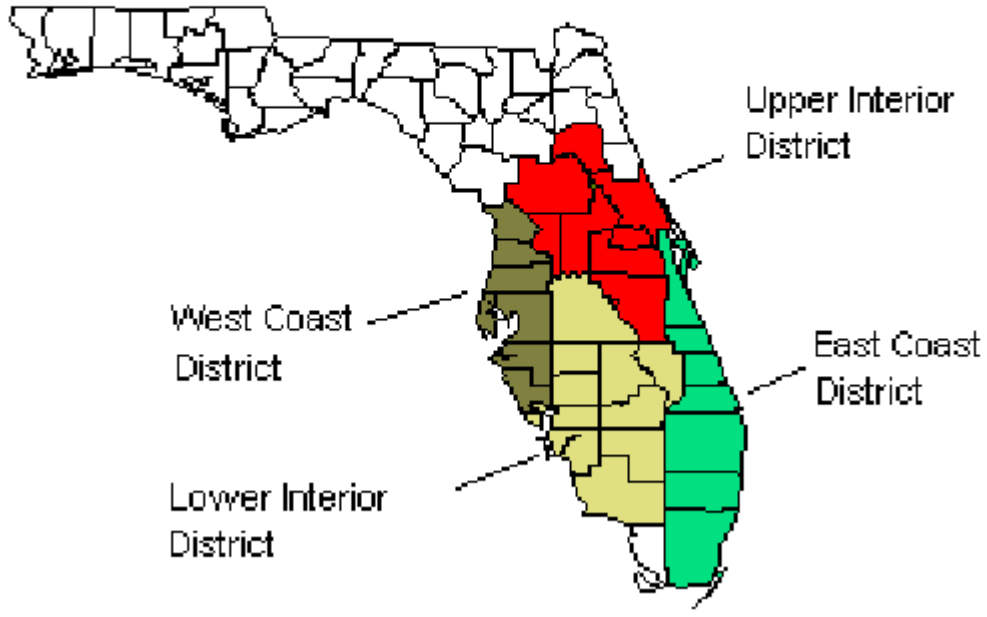


Figure 2. Citrus producing regions of Florida.

Citrus Growers

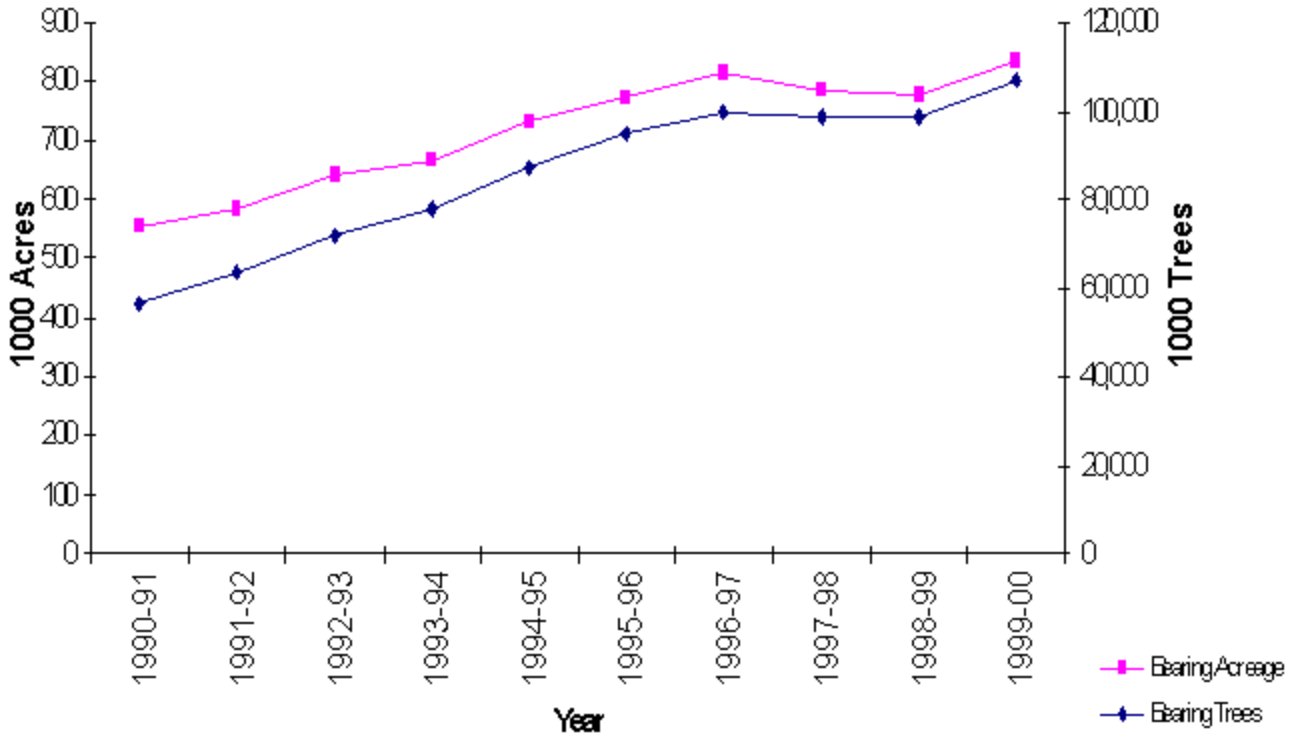
The number of citrus producers in Florida has remained fairly stable over the past 14 years, increasing slightly (1%) between 1987 and 1992, then declining by 6 percent to 7,676 farms in 1997 (Census of Agriculture). While the number of citrus producers declined, bearing and non-bearing citrus acreage per farm increased from 90 to 125 acres between 1987 and 1997. Production capacity of citrus growers in Florida increased steadily over the past 10 years, reaching 832 thousand acres of bearing groves and 97 million bearing trees in 1999-00 (Figure 3). Oranges accounted for 81 percent of the total population of citrus trees, followed by grapefruit (12%), tangerines (4%), tangelos (1%), temples, limes, lemons and K-early citrus (Table 2).

Table 2. Bearing acreage and number of bearing citrus trees in Florida, by variety, 1999-00.

Variety	Acreage (1000)	Trees (1000)
Oranges	666	87,200
Grapefruit	118	12,669
Tangerines	28	4,195
Tangelos	12	1,422
Temples	6	687
Limes, Lemons, K-early	3	482
Total All Varieties	832	97,381

Source: Fla. Agric. Statistics Service, Commercial Citrus Inventory, 2000

Figure 3. Bearing acreage and number of citrus trees in Florida, 1990-91 to 1999-00. Source: Florida Agricultural Statistics Service.



Citrus Fruit Production and Value

Production of Florida citrus fruit followed an upward trend between 1990 and 2000, increasing by 46 percent, to 298 million boxes (Figure 4). Oranges and grapefruit were the top citrus commodities, representing 78 percent and 18 percent of the total citrus boxes produced, respectively, in the 1999-00 season (Table 3). One box of citrus fruit is equivalent to 90 pounds in the case of oranges, 85 pounds for grapefruit, and 95 pounds for tangerines. Production of oranges and tangerines has increased substantially during the last ten years. About 89 percent of all citrus was sold for juice processing while 11 percent was sold as fresh fruit. For the top two citrus varieties, 96 percent of oranges and 66 percent of grapefruit went to the processed market.

Figure 4. Production of Florida citrus fruit, 1990-91 to 1999-00.

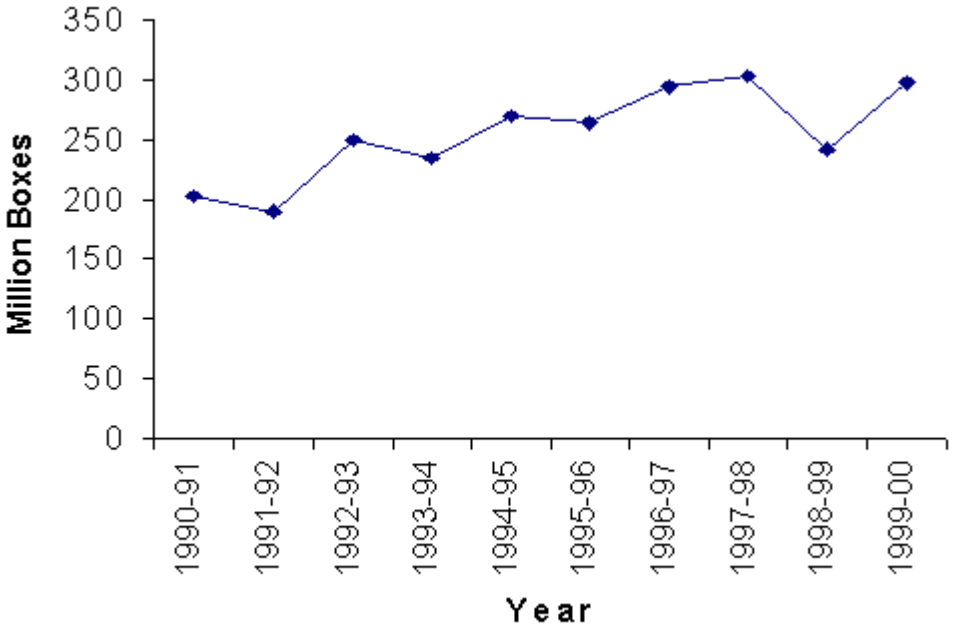


Table 3. Production quantity and value of Florida citrus fruit, by variety and market channel,1999-00.

	Quantity (1000 Boxes)		Value ($1000)*	
Variety	Fresh	Processed	Fresh	Processed
Oranges	9,395	223,605	71.6	1,236.5
Grapefruit	18,191	35,209	156.6	176.0
Temples	440	1,510	3.4	5.7
Tangelos	736	1,464	6.0	5.5
Tangerines	4,405	2,595	59.9	13.3
Total	33,167	264,383	297.6	1,437.1

Source: Florida Agricultural Statistics Service. *Value calculated from packinghouse door price multiplied by production quantity for each variety and market channel.

The value of citrus fruit received by packinghouses and processing plants totaled $1.73 billion for the 1999-00 season, with oranges accounting for the largest share of value (78%), followed by grapefruit (18%), tangerines (2%), and tangelos and temples (1% combined, Table 3). Approximately 83 percent of this value represented citrus sold for processing. Costs for harvesting and hauling fruit from groves to the packinghouse or processing plant averaged $1.84 per box, and were consistent across all citrus varieties.

Prices quoted for citrus fruit at different points in the marketing chain reflect the costs incurred as fresh citrus fruit is picked, hauled, and packed. Fruit produced for the fresh market consistently commanded higher prices than fruit intended for processing. Prices for fresh market fruit shipped in 1999-00 ranged from a high of $22.30 per box for tangerines to $15.00 per box for oranges and temples (Table 4).

Table 4. Prices for Florida citrus fruit, by variety and market channel, 1999-00.

Variety	Fresh, Packed[1] ($/box)	Fresh, received[2] ($/box)	Processed, received[2] ($/box)
Oranges	15.00	7.62	5.53
Grapefruit	16.60	8.61	5.00
Tangelos	15.80	8.20	3.79
Tangerines	22.30	13.60	5.11
Temples	15.00	7.80	3.77
K-Early	15.60	8.00	2.82

Source: National Agricultural Statistics Service, Agricultural Prices.
[1]Free-on-board value, includes value added to fruit at packing houses.
[2]Packing-house door value, reflects value of the fruit delivered to a packing house or processing plant.

Fresh Citrus Packinghouses

Fresh citrus fruit is sorted and packed for shipment at packinghouses. During the 1999-00 season, there were 108 citrus packinghouses in Florida, with 54 firms located in the East Coast District, 15 in the Upper Interior, 29 in the Lower Interior, and 10 firms in the West Coast District. The majority of citrus fruit was packed in the East Coast District (55%) followed by the Lower Interior (30%), Upper Interior (14%), and the West Coast District (1%, Table 5). Grapefruit was the most important fresh citrus variety, representing 59 percent of all fresh fruit packed, followed by oranges (25%), tangerines (15%), and tangelos (2%). About three quarters of the packinghouse firms were located in the East Coast and Lower Interior Districts, which produce 95 percent of Florida's grapefruit. The packing cost for fresh fruit was $7.75 per box, reflecting an average mark-up in value of 89 percent above the value as received at the packinghouse door (Table 4).

Table 5. Fresh citrus fruit shipped by Florida packinghouses, by district and variety, 1999-00.

District	Grapefruit	Oranges	Tangelos	Tangerines	Total
			1000 boxes		
East Coast	53,272	7,203	904	2,760	64,140
Lower Interior	8,891	15,394	873	9,614	34,773
Upper Interior	5,446	5,901	359	4,369	16,075
West Coast	242	703	16	56	1,016

Source: Florida Department of Agriculture and Consumer Services, Division of Fruit and Vegetables, Winter Haven, Florida.

Citrus Processing Plants

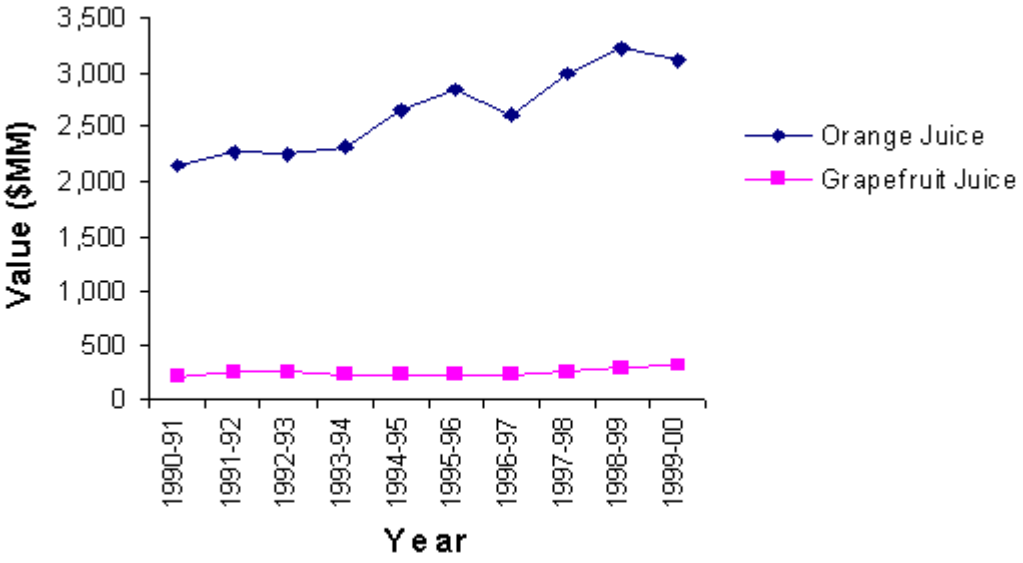
There are presently 52 citrus processing plants in the state of Florida. These plants collectively processed 264 million boxes of fruit in 1999-2000. Citrus processors produce fruit juices, including frozen concentrate, chilled, and canned juices. Juice products shipped by Florida processors in 1999-00 were valued at $3.5 billion. Orange juice, including juice made from tangerines and temples, was valued at $3.1 billion or 91 percent of the total, while grapefruit juice was valued at $326 million (9%, Table 6). Chilled juices accounted for 58 percent of the value of all juice products, followed by frozen concentrated juice (40%), and canned juice (2%). Between 1990-91 and 1999-00, the real (inflation adjusted) value of orange and grapefruit juices increased by 46 percent and 60 percent, respectively (Figure 5). This was due to growth in value of frozen concentrate and chilled juice products, while value of canned juices declined.

Table 6. Value of processed Florida citrus juice products, 1999-00.

Product	Orange Juice	Grapefruit Juice	All Citrus Juice
		million dollars	
Frozen Concentrated	1,229	154	1,384
Chilled	1,835	164	2,000
Canned	63	7	70
Total All Juice Products	3,127	326	3,453

Source: Florida Citrus Mutual.

Figure 5. Value of processed Florida orange and grapefruit juice, 1990-91 to 1999-00.



1999 Dollars
Source: Florida Citrus Mutual.

Citrus processing plants also produce several important byproducts, including citrus pulp and meal, molasses, and the essential oil d-limonene. Pulp, meal and molasses are marketed as a cattle feed supplement. D-limonene is used for a variety of chemical products such as cleaners, disinfectants, flavors and fragrances. During the 1999-00 season Florida citrus processors produced 1,370,000 tons of pulp and meal, 31,000 tons of molasses, and 35 thousand pounds of D-limonene. Collectively, these byproducts were valued at $123 million, with pulp and meal accounting for nearly $88 million (71%), followed by d-limonene at $33 million (27%), and molasses at $2 million (2%, Table 7).

Table 7. Value of processed Florida citrus byproducts, 1999-00.

	million dollars ($)*
Citrus Pulp and Meal	87.9
D-Limonene	33.1
Molasses	2.1
Total	123.1

Source: Florida Citrus Processors Association
*Value estimated from production quantities multiplied by corresponding average annual prices reported in *Feedstuffs* and *Chemical Market Reporter*.

Economic Impact Analysis

An export-based industry such as the Florida citrus industry impacts the regional economy three primary ways, referred to as direct, indirect and induced effects (Miller and Blair, 1985). As direct effects, citrus growers, packinghouses and processors generate output and value added, and provide employment and wages to employees. As indirect effects the industry supports other regional enterprises through inter-industry purchases of inputs to the production process. As induced effects, personal consumption expenditures by employees in both the citrus industry and complementary businesses further stimulate the local economy. The total economic impacts are the sum of the direct, indirect and induced effects. Since exported goods introduce new money to Florida, commodity sales outside of the state are associated with greater economic impacts than sales to Florida consumers. Also, inputs obtained from Florida firms rather than imported from outside of Florida are associated with greater economic impacts because money is retained and circulated within the state.

The total economic impacts of the citrus industry in Florida were estimated with economic multipliers developed using the *IMPLAN PRO* software and associated databases for Florida licensed from Minnesota Implan Group (MIG, Inc.). The *IMPLAN* system enables construction of regional input-output models for any county, group of counties, or state in the United States based on a combination of county level and national economic data. Industries are classified in 528 sectors, corresponding to the four-digit Standard Industrial Classification (SIC) System. Multipliers for each sector are available for the economic indicators of output, value added, employment, employee compensation, labor income, other proprietary income and indirect business taxes. Total economic impacts were computed by applying the economic multipliers as follows:

$$\text{Total impact} = Y * M_{D(\text{Output, VA, Emp})} + E * M_{I(\text{Output, VA, Emp})} + E * M_{IN(\text{Output, VA, Emp})}$$

where, E is export sales (all sales outside Florida), Y is value of output,

$M_{D(\text{Output, VA, Emp})}$ is the direct effects multiplier for output, value-added, employment,

$M_{I(\text{Output, VA, Emp})}$ is the indirect effects multiplier for output, value-added, employment,

$M_{IN(\text{Output, VA, Emp})}$ is the induced effects multiplier for output, value-added, employment.

In the IMPLAN system, citrus growers are classified under the 'fruits' sector that includes berry crops, grapes, and deciduous tree fruits, in addition to citrus fruits. Citrus processors are aggregated with processors of frozen fruits and vegetables, frozen fruit juices and concentrates, quick frozen and coldpack fruits and vegetables, and dried citrus pulp. The fruits sector of the Florida IMPLAN model was customized to reflect the specific characteristics of fresh citrus production based on operating budgets for Florida citrus growers (Muraro et al., 2000). Default information for the processing sector was not modified due to lack of data on operating expenditures. Economic multipliers used for this analysis are shown in Table 8. For example, the indirect value added multiplier for the fruits sector (0.321) indicates that for each dollar of industry output sold to final demand $.321 was generated in value added.

Table 8. Economic multipliers for the Florida citrus industry.

	Fruits				Frozen Fruits, Juices and Vegetables			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Output ($/$)	1.000	0.570	0.767	2.337	1.000	0.558	0.770	2.328
Value Added (per $ output)	0.233	0.321	0.506	1.061	0.259	0.317	0.506	1.082
Employment (jobs per million $ output)	13	13	10	36	5	6	11	21

Source: MIG, 1998, *Implan* data for Florida.

The total value of output of fresh citrus fruit, citrus juice, and processed citrus by-products was $4.1 billion during the 1999-00 season (Table 9). The value of exports (sales outside Florida) of citrus products was $3.81 billion. Ninety seven percent of fresh citrus, 94 percent of citrus juice products, and 81 percent of citrus by-products were exported outside the state of Florida. The value of citrus juice exports was calculated by deducting the estimated Florida consumption from the total value of output. It was assumed that national per capita consumption of citrus juices, and prices for citrus juices applied in Florida. The proportion of d-limonene and molasses exported from Florida was assumed to be consistent with the proportion of citrus pulp and meal exported.

Table 9. Value of Florida citrus industry output and exports, 1999-00.

	Output ($million)	Exports ($million)
Fresh Citrus Fruit	493.6	476.6
Processed Citrus Juice and Byproducts	3,575.7	3,332.7
Total	4,069.3	3,809.3

Source: Florida Department of Agriculture and Consumer Services, National Agricultural Statistics Service, Florida Department of Citrus, Florida Citrus Mutual.

Total economic impacts of the state's citrus industry were estimated at $9.1 billion in output, 89,700 jobs, and $4.2 billion in value-added (Table 10). The total value added, includes wages earned by industry employees, income to business owners, and business taxes paid. This represents the net economic contribution by the industry to the state economy. The total economic impacts of processed citrus juice and byproducts included $8.0 billion worth of output, over 72,000 jobs and $3.7 billion in value added. Total economic impacts of fresh citrus fruit included $1.1 billion in output, over 17,000 jobs, and $509 million in value added. Note that in order to avoid double-counting of impacts, the impact estimates for the processed citrus sector represent the farm production activities of citrus fruit utilized for juice, while the impact estimates for the fresh fruit sector represent only the fruit sold for fresh consumption. Direct impacts accounted for 45 percent of output, 26 percent of employment, and 25 percent of value added impacts for the industry. Indirect impacts amounting to $2.13 billion in output, represented economic activity stimulated in other business sectors that furnish inputs to citrus production and processing, and were 23 to 30 percent of total economic impacts. Induced impacts, amounting to $2.93 billion in output, represent additional personal consumption expenditures resulting from employee earnings. The induced effects were 32 percent of total output impacts, 45 percent of total employment impacts, and 46 percent of total value added impacts. Thus, the total economic impacts were over twice as great as the direct impacts of industry sales.

Table 10. Economic impacts of Florida's citrus industry, 1999-00.

	Direct	Indirect	Induced	Total
Output ($ million)				
Fresh Citrus Fruit	493.6	271.8	365.4	1,130.7
Processed Citrus Juice and Byproducts	3,575.7	1,859.0	2,567.4	8,002.1
Citrus Industry Total	4,069.3	2,130.7	2,932.8	9,132.8
Employment (Jobs)				
Fresh Citrus Fruit	6,288	6,186	4,998	17,471
Processed Citrus Juice and Byproducts	16,595	20,699	35,012	72,306
Citrus Industry Total	22,883	26,885	40,010	89,778
Value Added ($ million)				
Fresh Citrus Fruit	115.0	153.2	241.2	509.4
Processed Citrus Juice and Byproducts	925.8.0	1,056.0	1,686.3	3,668.2
Citrus Industry Total	1,040.9	1,209.3	1,927.5	4,177.7

Discussion and Conclusions

This study demonstrates that the Florida citrus industry has a very large impact on the state's economy, estimated at $9.13 billion in output and $4.18 billion in value added in the 1999-2000 season. The magnitude of total economic impacts was over twice as large as the direct impact of industry sales, as a result of the high proportion of total output that is shipped outside the state, which brings new money into the regional economy and stimulates additional economic activity. Industry production and value have increased significantly over the past ten years. The information used for this analysis was the most recent available, and appears to have been a normal year for the industry, consistent with long term trends.

The economic impacts of the Florida citrus industry estimated in this study were significantly larger than indicated by previous studies (e.g. Benioudakis and Brown, 2000), due to continued growth in the industry, and use of an updated regional economic model. The *Implan* multipliers used in this analysis more fully accounted for the indirect and induced effects than previous models, particularly the impact of personal consumption expenditures. Multipliers used for the fresh fruit sector were based on production expenses for Florida citrus fruit production. A limitation of this study is that information on expenditures by Florida citrus processors was not available. So, the multipliers used for the processing sector reflected typical interindustry expenditures for fruit juice and frozen vegetable processing firms throughout the US. To the degree that Florida citrus processing firms differ from national averages in the pattern of expenditures, the results of this analysis may vary.

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