

Table 7. Effect of percentage change in annual costs to internal rate of return.

Annual change in cost (%)	Internal rate of return (%)	
	South Florida	North Central Florida
+ 10	9.48	9.30
0	10.25	10.24
- 10	11.04	11.08

Table 8. Effect of percentage yield reduction due to freezes in North Central Florida.

Annual decrease in yield (%)	Discounted net operating income @ 10% rate (\$)	Discounted annual net cash flow @ 10% rate (\$)	Internal rate of return (%)
8	3,366	-63	9.87
6	3,538	110	10.24
4	3,710	282	10.60
2	3,883	454	10.95

### Summary and Conclusions

Management skills and cost-efficient operations will be necessary for a successful citrus production in the future. Increased competition and potentially lower prices puts pressure on producers to make good decisions and

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## THE FUTURE OF THE FLORIDA ORANGE INDUSTRY

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**Abstract:** The Florida orange industry is in a state of change with respect to both production and marketing environments. The dynamics of the industry include shifts in orange juice demand, freeze-reduced Florida orange crops, and increased Brazilian and out-of-state competition. This report provides projections of orange juice supply and demand, and an assessment of the implications of the market trends for Florida's orange industry.

Florida's orange industry has been popularly described as "in transition." This transition involves 3 major factors: growth and shifts in orange juice demand, the 4 freezes of this decade, and expansion of Brazilian orange production. Discovery of citrus canker in Florida nurseries in Aug.

maximize profits. This paper presents one method of evaluating investment decisions. There are several alternative methods available. Specific conditions, objectives and limitations of the individual firm's situation must be considered in both location and production decisions. The purpose of this paper has been to stimulate an increased awareness of the importance of management decisions to potential profits in the future.

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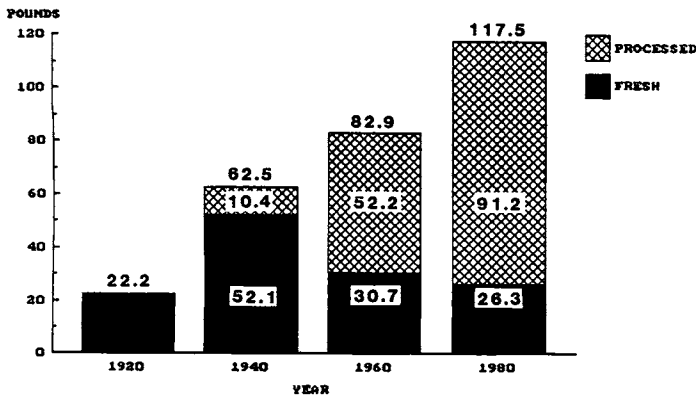
1984 has contributed to the uncertainty regarding planting decisions.

Given the nature of citrus production, where a large investment of time and capital is required before any returns can be realized, formulation of expectations about the future is critical to development of business plans. The purpose of this report is to briefly describe how the above-mentioned factors will impact on the welfare of the industry in the years ahead.

### Per Capita Citrus Consumption

Florida's orange industry has benefited tremendously as a result of demand growth. Per capita consumption of citrus in the U.S. roughly doubled between 1940 and 1980 (Fig. 1). It increased from 62.5 lb. in 1940 up to 117.5 lb. in 1980 measured on a fresh weight equivalent basis. During the 40-year period there were also significant shifts in demand for processed versus fresh products which have benefited Florida's orange industry. Fresh citrus consumption declined by 50% during the 40-year period. Average fresh consumption was 52 lb. per capita in 1940 and 26 lb. per capita in 1980. Processed consumption increased by about nine-fold during the same time period. Processed consumption was about 10 lb. per capita in 1940 and 91 lb. per capita in 1980. Given Florida's orientation to production of juice type varieties, the state has realized significant gains from the expansion in demand for processed products.

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Pounds = Fresh Weight Equivalent.

Fig. 1. U.S. citrus per capita consumption.

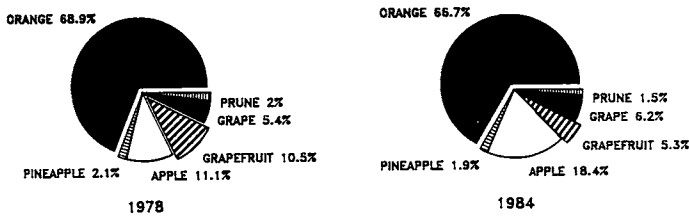


Fig. 2. U.S. juice sales (percent).

### Orange Juice Demand

Orange juice is the single most important fruit juice in the American consumers' diet. Typically, orange juice accounts for about two-thirds of the volume of the principal fruit juices sold in the U.S., including apple, grapefruit, grape, pineapple, and prune (Fig. 2). Orange is a flavor that is universally liked; orange juice is healthful; and it is a product that fits into consumers' lifestyles. Because of these factors, orange juice demand is expected to continue expanding in the years ahead.

In the 10-year period through 1982-83, retail sales of orange juice in the U.S. expanded at a rate of 4.6% annually with sales of ready-to-serve (R-T-S) orange juice accounting for almost all the growth in demand (Fig. 3). That expansion took place during a period when retail orange juice prices were increasing but at a rate similar to price changes of other goods and services. In constant dollar terms, retail orange juice prices were relatively flat or declining.

In the past 2 seasons (1983-84 and 1984-85), retail orange juice prices have increased at a faster rate than prices of other consumer goods and services as shown in Fig. 4 by the "real" price line. Retail orange juice prices were up by 14.8% in 1983-84 from 1982-83, and in 1984-85 the price level is expected to be up by an average of 8.6%. The general price level increased by 4.3% and 3.5% in 1984 and 1985, respectively. Despite the increase in relative orange juice prices in the last 2 seasons, sales have declined only slightly. Retail sales are expected to total 830 million single strength equivalent (SSE) gallons in 1984-85 compared with 856 million SSE gallons in 1983-84, a 3% decline. The modest decline in sales volume is an indication of the strength of the domestic orange juice market. The sales trends reflect a product with broad consumer appeal. Typically, 83% of the U.S. households purchase orange juice during any given year.

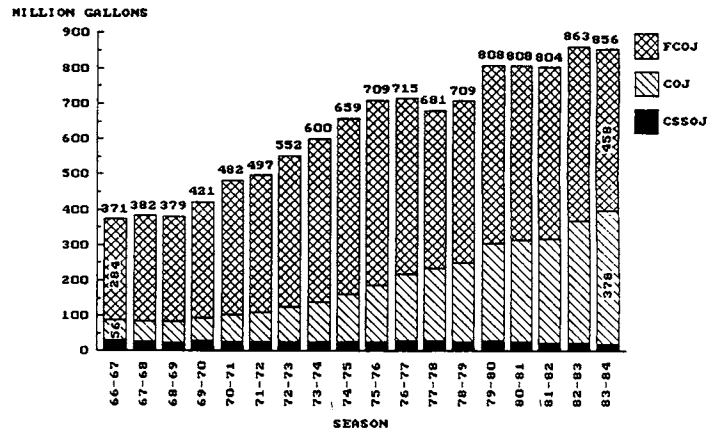
### Demand Projections

The demand for orange juice is a function of population, consumer income, prices of substitutes, changes in tastes and preferences, and the price of the product. Given expected trends in these factors, orange juice sales will continue to increase. Assuming the retail price returns to the 1982-83 level in constant dollar or real terms and increase with general price level, orange juice sales are expected to expand at an annualized rate of 3.8% through 1995. To the extent that prices fall below the 1982-83 level, demand is expected to expand at a faster rate.

### Orange Juice Supply

Demand is obviously only half the equation. Supply is of equal importance in price determination. Orange juice supplies are primarily a function of orange production in Florida and Brazil. Florida's freezes in combination with Brazil's continued expansion of production have given Brazil the distinction of being the largest orange producing country in the world. Brazil's production has consistently exceeded production in Florida since the early part of the 1980's (Fig. 5).

The relative importance of Florida and Brazil in the orange juice market flip-flopped almost overnight. Florida produced 251.1 million 42° Brix gal. of FCOJ in 1979-80 compared with Brazil's 146.2 million gal. (Table 1). In 1983-84, Florida produced 118.4 million 42° gal. compared with Brazil's pack of 250.3 million gal.



Source: A. C. Nielsen

Fig. 3. Nielsen orange juice sales.

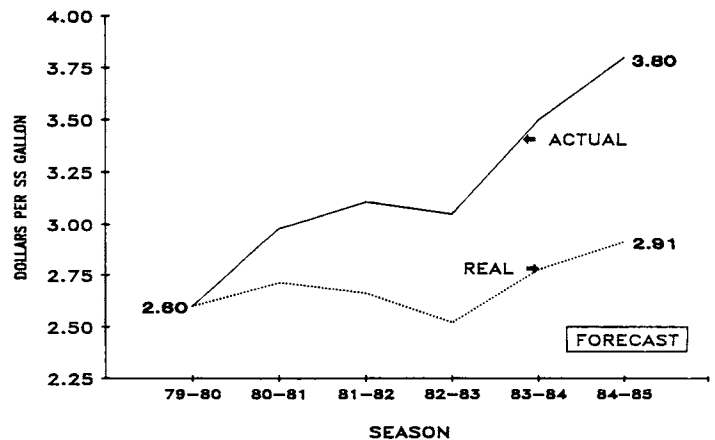
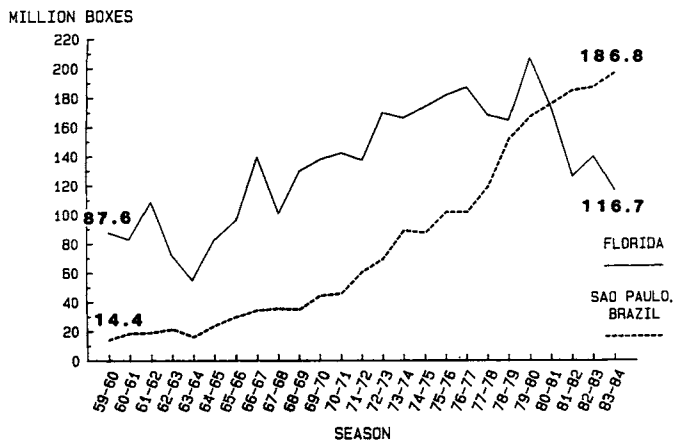


Fig. 4. Orange juice prices, actual and real.



Source: Florida Crop and Livestock Reporting Service, and Instituto de Economia Agrícola

Fig. 5. Orange production, Florida and Sao Paulo, Brazil.

Table 1. FCOJ production, 1979-80 through 1984-85 seasons.

Season	Production (million 42° Brix gallons)	
	Florida	Brazil
1979-80	251.1	146.2
1980-81	181.5	165.2
1981-82	133.3	202.1
1982-83	169.6	189.6
1983-84	121.2	169.0
1984-85	118.4	250.3

### Brazilian Orange Juice Supply-Demand Situation

Brazil has the capacity to continue expanding orange production. Production expansion has occurred at extremely high rates in the past decade. The commercial tree inventory in the state of Sao Paulo, Brazil doubled in the 10 years between 1972 and 1981. In 1972, there were 50.2 million trees in Sao Paulo compared with a tree inventory in 1981 of 106.2 million trees, an annualized increase of 8.7%. If Brazil's inventory expands at just half the rate observed between 1972 and 1981, the inventory would be in excess of 170 million trees by 1995.

Continuation of expansion in Brazil will depend upon the expected returns from orange production. On-tree orange prices in Sao Paulo will be at record high levels in the 1985-86 season (Table 2). The estimated U.S. dollar equivalent on-tree price for Brazilian oranges is projected to be \$2.94 per box compared with a previous high price of \$2.12 per box in 1981-82. The higher price levels of the last 2 seasons will likely encourage continued expansion of commercial plantings.

Brazil's orange production expanded in response to expanding export demand for FCOJ. An increasingly larger percentage of Brazil's production has been exported to the U.S. in recent years. In 1984, 62.7% of Brazil's FCOJ exports were to the U.S. compared with 11.6% ten years earlier (1975) (Fig. 6). Part of the reason for the increase results from the fact that Florida's production was reduced by freezes. In addition, Brazil's markets outside the U.S. have weakened as a result of higher FCOJ prices and the strength of the U.S. dollar, Brazil's pricing unit.

The price for Brazilian FCOJ increased from \$844 per metric ton (65° Brix) in 1980 to \$1,563 per metric ton in

Table 2. Brazilian on-tree orange prices.<sup>2</sup>

Season	Cruzeiros/Box	Dollars/Box
1975-76	8	0.90
1976-77	10	0.85
1977-78	30	2.00
1978-79	36	1.72
1979-80	51	1.70
1980-81	108	1.65
1981-82	210	2.12
1982-83	400	1.27
1983-84	850	0.97
1984-85	4,500	2.10
1985-86	18,300 <sup>y</sup>	2.94 <i>Expected</i>

<sup>2</sup>Source: Agriculture Attache, Sao Paulo, Brazil.

<sup>y</sup>20,000 CR less 1,700 CR for grower contribution to value added tax.

Table 3. Average Brazilian FCOJ prices FOB Santos

Year	Dollars/MT 65° Brix
1980	844
1981	1,081
1982	1,100
1983	1,100
1984	1,563
1985	1,600 <sup>2</sup>

<sup>2</sup>Estimate based on minimum export prices.

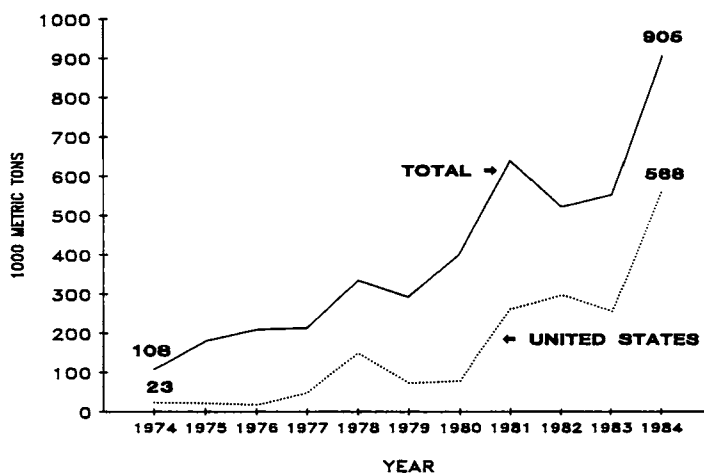


Fig. 6. Brazilian FCOJ exports.

1984, an 85% increase (Table 3). The strengthening U.S. dollar served to further increase the price of Brazilian FCOJ outside the U.S. market. The German mark, for example, declined in value by 91% from 1980 through 1984 (Fig. 7). Realignment of the European currencies against the U.S. dollar and lower Brazilian FCOJ prices would be expected to enhance world demand for Brazilian concentrate. However, some feel that the European orange juice market may have suffered long-term damage because of growth in demand for juice drinks and nectars. Thus, the U.S. has become an increasingly important market for Brazil and will likely continue to be the destination of a large portion of Brazil's exports in the years ahead. Construction of tank farms in the northeastern U.S. will likely result in an increasing volume of imports into U.S. ports outside Florida.

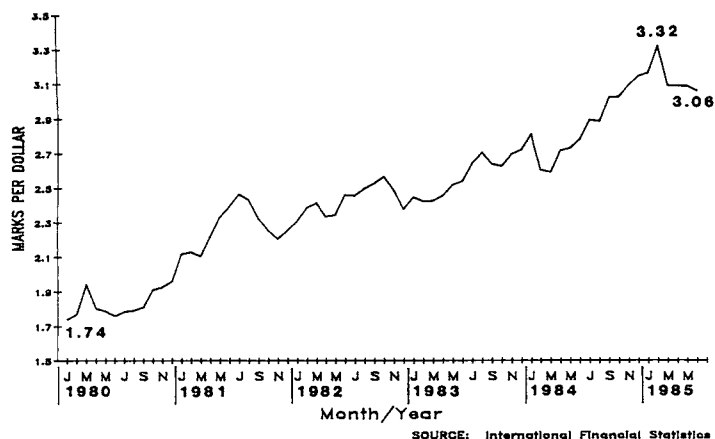


Fig. 7. Deutsche marks per U.S. dollar, Jan. 1980 through June 1985 (market rate/par or central par).

### U.S. FCOJ Imports

Prior to the 1982-83 season, at least 80% of FCOJ imports entered through Florida ports (Table 4). Florida processors were Brazil's most important customers in the U.S. In 1982-83, imports into Florida ports accounted for 66% of the imported volume, decreasing to 63% of the volume imported in 1983-84. During the first 8 months of the 1984-85 season imports into Florida ports have represented 59% of the total volume of FCOJ imports into the U.S. Imports into ports outside of Florida have increased, in part, because of growth in demand for ready-to-serve (chilled) orange juice, a product easily packaged by existing dairy operations outside Florida. Because of the expected continued growth in demand for ready-to-serve product and Brazil's pricing strategy, the trend in imports around Florida will likely continue as a competitive factor.

### Brazilian Cost Advantage

Brazilian processors have historically enjoyed a production cost advantage over the Florida processor. For example, Brazilian pick and haul costs are reportedly one-third of the Florida costs. Brazil's cost advantage translates into a marketing advantage. The Brazilian industry can sell at a lower price and still recover costs. The cost advantage will become a more important factor as Florida recovers from the impact of the 4 freezes in the last 5 seasons.

### Florida Orange Production Projections

Prior to 1980, Florida experienced a major freeze about every 9 years. In the early 80's long-term production estimates for the decade of the 80's suggested that orange and

Table 4. U.S. FCOJ imports, all sources, 1980-81 through 1984-85 seasons.<sup>2</sup>

Port	Season <sup>y</sup>									
	1980-81		1981-82		1982-83		1983-84		1984-85 <sup>x</sup>	
	Quantity (SSE gal. × 1000)	% of total	Quantity (SSE gal. × 1000)	% of total	Quantity (SSE gal. × 1000)	% of total	Quantity (SSE gal. × 1000)	% of total	Quantity (SSE gal. × 1000)	% of total
Florida	166,970.5	80.11	303,631.6	81.15	248,694.4	65.95	337,559.1	63.27	256,719.4	59.12
Other	41,445.6	19.89	70,516.9	18.85	128,395.3	34.05	195,970.2	36.73	177,521.1	40.88
Total	208,416.1	100.00	374,148.5	100.00	377,089.7	100.00	533,529.3	100.00	434,240.5	100.00

<sup>2</sup>Source: U.S. Department of Commerce, IM-145X.

<sup>y</sup>Dec. through Nov.

<sup>x</sup>1984-85 data are for Dec. 1984 through July 1985.

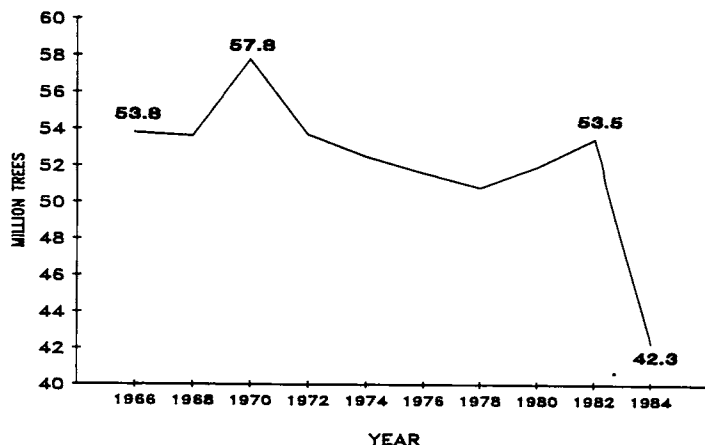


Fig. 8. Florida round orange tree inventory.

Temple production would range between 200 and 220 million boxes. Actual production has ranged as low as 107.2 million boxes including Temples. Production is expected to return to prefreeze levels. However, recovery is likely to take at least a decade due to the necessity of replanting or planting of additional acreage.

Florida's 1984 commercial orange tree inventory is at the lowest level since the report was initiated in 1966 (Fig. 8). The Florida Crop and Livestock Reporting Service "Citrus Tree Census" of Aug. 1985 revised the 1984 inventory in 14 counties which were most severely damaged in the 1985 freeze. This revision reduced the total commercial production area to 474,616 acres compared with 627,174 acres in 1980. The revised 1984 inventory is 42.3 million trees compared with 52.0 million trees in 1980. The freezes and planting trends have also resulted in a shift in the age distribution of the orange trees. Almost 33% of the inventory is made up of trees less than 10 years of age (Table 5).

Table 5. Age distribution of Florida round orange trees by inventory.<sup>2</sup>

Year	Tree age (% of total)					Total trees (× 1,000)
	≤ 4	5-9	10-14	15-24	≥ 25	
1984	22.9	10.0	6.6	36.5	24.1	42,294
1982	13.9	6.9	7.2	40.2	31.8	53,505
1980	8.9	6.9	13.0	39.1	32.2	51,978
1978	6.7	7.7	23.4	31.5	30.6	50,843
1976	6.2	10.0	29.7	24.1	29.8	51,595
1974	5.8	21.0	27.8	16.9	28.4	52,522
1972	7.3	29.5	22.0	14.1	27.0	53,731
1970	14.5	32.8	14.8	13.4	24.4	57,802

<sup>2</sup>Source: Florida Crop and Livestock Reporting Service.

Projections of Florida's orange production for the next decade are based on 4 factors—the tree inventory, the yield per tree by age group, assumed plantings, and assumed tree loss rates. The yield, plantings and tree loss rates are based on observed historical levels. The yield reflects averages per tree reported by the Florida Crop and Livestock Reporting Service during 1973-74 through 1982-83. Tree losses reflect average rates for 1972 through 1982.

Planting rates are based on observed trends during 1979 through 1983. During this period early and mid-season varieties were planted at a rate of 1.4 million trees per year with the rate for Valencias averaging about 900,000 trees per year. Temples were planted at a rate of 9,000 trees per year. Planting rates in future years will depend upon the profitability (or expected profitability) of orange production. Planting rates could well exceed the levels observed during the 1979-83 period. In order to check the sensitivity of future production levels to higher planting rates, production estimates were developed for 3 different rates: the average observed, double the average, and triple the average.

Based on the assumptions outlined, production of round oranges and Temples is projected to increase from 134 million boxes in 1986-87 up to 188 million boxes by 1995-96 if planting rates are maintained at the average rate observed during 1979 through 1983 (Fig. 9). Variation in planting rates will not impact on orange production until 1989-90 when trees planted in 1986-87 would begin to bear fruit. Production is projected to reach 196 million boxes by 1995-96 if the planting rate is doubled and 229 million boxes within 10 years if the planting rate is tripled. The production estimates should be viewed as trends with production varying from season to season due to grove care practices or general growing conditions. Florida's recovery from the past 4 freezes will likely take a decade. Even though Florida production is expected to return to near prefreeze levels during the next decade, orange juice production from Florida fruit will not be adequate to supply the expanding U.S. market. Thus, imports will continue to be needed. Without expanding markets outside the U.S., Brazil's expected orange production increases in combination with recovery of production in Florida are likely to put downward pressure on orange prices.

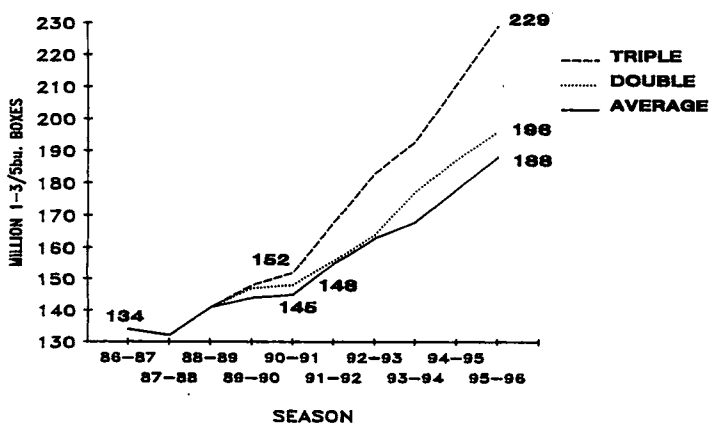


Fig. 9. Florida orange and Temple production estimates with various tree planting assumptions.

The above supply-demand scenario has implications in 3 major areas: Florida's production efficiency, U.S. tariff maintenance, and Florida's marketing efforts.

### Implications of Supply-Demand Trends

Brazilian FCOJ exporters, once primarily supplemental suppliers to the U.S. market, are now also a major competitive consideration. Increased Brazilian competition necessitates improved production efficiency for the industry to be able to remain competitive.

From the orange growers' perspective, the industry's legislative efforts should continue in order to maintain the U.S. citrus tariffs that help to level the playing field for the Florida citrus industry. Reductions in the U.S. tariff will undermine Florida's competitive position in the market.

Finally, Florida's marketing efforts should continually be evaluated to insure that the programs are as effective as possible. Florida's success in the orange juice market resulted in large measure because of a history of successful marketing programs. The market situation has changed. When Florida supplied 95% of the orange juice in the U.S. market, the benefits of the marketing programs accrued in large measure to the Florida citrus industry. The decline in the share of the market supplied by Florida means that other suppliers are benefiting from Florida's generic marketing efforts. This situation does not mean that Florida should discontinue marketing efforts but simply indicates the necessity of undertaking programs that more closely tie promotional efforts to Florida processed products. The program initiated this fall reflects a change in the generic marketing program that is designed to take advantage of Florida's orange juice standards. The "seal of approval" is the symbol being licensed for use to differentiate the product in the marketplace.

The Florida orange industry has continually adapted to change. The industry has a strong base and orange juice demand is expected to continue to expand. No doubt the industry will meet the challenges posed by nature and the expected competitive environment in years ahead.

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