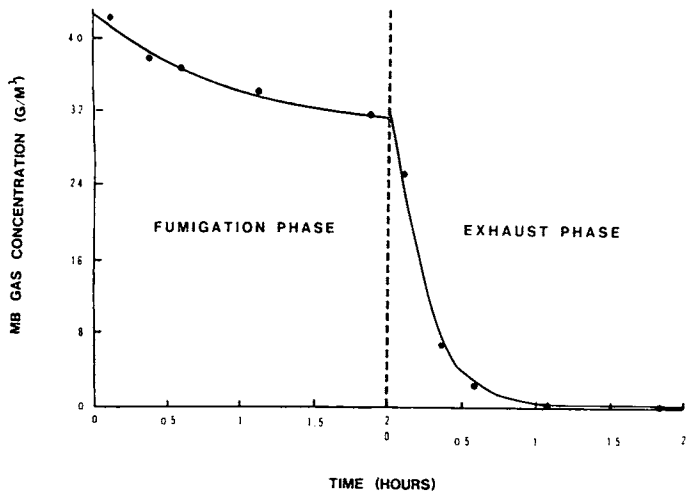

Fig. 2. Gas concentration readings taken during a typical methyl bromide fumigation of a semi-trailer load of grapefruit in a 266-m³ chamber. Dosage applied: 40 g/m³. Each point on the curve represents the mean reading for 12 sampling points. within the chamber.

Table 2. Methyl bromide (MB) concentrations during fumigation of a semi-trailer loaded with 972 citrus boxes (4/5 bushel) containing styrofoam balls (266 m³ chamber—40 g/m³ MB for 2 hr). Values cover 12 locations.

Sampling time (min)	Range in concentration of MB in air (g/m³)
0	40-43
15	37-38.5
30	36-37.5
60	34-35
120	31-33

the logarithm of the residue concentration is linear. When a linear regression calculation was applied to the data for 1 to 5 days, correlation coefficients of −0.993 to −0.997 were obtained for the 3 tests, indicating a good linear relationship. The half-life (time for the residue to decrease 50%) ranged from 1.12 to 1.15 days for the 3 tests. Extrapolation of the data indicates that levels of 10 ppb and 1 ppb would be reached in 10 and 14 days, respectively, for grapefruit stored at 60°F. These results indicate that MB residues would not be a problem for foreign shipments of grapefruit stored at 60°F during transportation.

Table 3. Methyl bromide residues in grapefruit after fumigation with 40 g/m³ MB for 2 hr at 75-85°F.[z]

Time (days)	MB residues (ppm)[y] Test 1	Test 2	Test 3
0	9.07 ± 1.38	10.74 ± 1.37	9.59 ± 1.44
1	2.85 ± 0.63	2.66 ± 0.35	3.35 ± 0.54
2	1.21 ± 0.53	1.21 ± 0.17	1.51 ± 0.32
3	0.68 ± 0.06	0.81 ± 0.14	—
5	0.24 ± 0.03	0.22 ± 0.06	0.27 ± 0.15

[z]Fruit stored at 60°F after fumigation.
[y]Average ± standard deviation based on 8 samples for tests 1 and 3, and 12 samples for test 2 (2 or 3 fruits from each of 4 boxes).

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Proc. Fla. State Hort. Soc. 97:125-128. 1984.

POTENTIAL FOR THE EXPANSION OF THE TOMATO PROCESSING INDUSTRY IN FLORIDA[1]

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Abstract. **The purpose of this study was to evaluate the processing potential for Florida grown tomatoes. Production of tomatoes specifically for processing and the improved utilization of ripe tomatoes remaining from fresh market production were evaluated. Estimated costs and returns were developed for processing tomatoes under different production regimes and for fresh market tomatoes. Highest returns to the grower are from hand harvest of salvage tomatoes with no additional inputs after the last fresh market harvest. All systems dedicated specifically to the production of tomatoes for processing, at realistic yields and prices, resulted in negative returns. Estimated costs and returns were developed for processing tomatoes under different production regimes and for fresh market tomatoes. These are as follows: 1. production for fresh market; 2. production for processing, assuming low input levels; 3. production for processing, assuming high input levels; 4. salvage for processing, assuming no inputs after the last commercial fresh market harvest; 5. salvage for processing, assuming additional inputs after the last commercial fresh market harvest. Relative evaporation costs and concentrated product costs were estimated for processing tomatoes with various solids content. A table for tomato concentrates at 26% soluble solids was developed.**

According to the "Florida Agriculture in the '80's" report (4), "the Florida tomato industry is a dynamic and significant segment of the agricultural income of the state, representing approximately 30 percent of the total cash income from vegetables. In dollar value at the farm gate, tomatoes exceed $250 million and are worth almost $800 million in retail value. Florida is the major U. S. supplier for fresh market tomatoes during the late fall, winter and early spring marketing seasons."

"Florida tomato growers use the most intensive and sophisticated technology available in the production, harvest-

[1]Florida Agricultural Experiment Stations Journal Series No. 5976.

ing and handling sequence. Tomato growing in Florida is a high risk enterprise which demands frequent adjustments to unfavorable weather, sudden pest pressure, competition from imports and a wide range on constraints from regulatory agencies."

The Florida tomato processing industry exists as an appendage to the fresh vegetable industry. There are 5 small canners packing primarily whole tomatoes for the consumer market. These are marginal processors who depend upon supplies of salvage ripe tomatoes from fields grown for fresh-market green tomatoes. The continued supply of these salvage tomatoes is uncertain due to anticipated changes in grower technology and the initiation of mechanical harvesting for fresh-market tomatoes. Production of whole canned tomatoes has decreased from over 3 million cases in 1968 to approximately 1 million cases in 1983.

The annual processing utilization of Florida tomatoes has decreased from approximately 68,000 tons in 1963-68 period to approximately 20,500 tons in the 1978-81 period (Table 1). Average value for a 30 lb. box of ripe tomatoes for processing was $0.99 for the period 1978-81 (Table 2).

Table 1. Average annual production of Florida tomatoes.

Crop years	Production (1,000 30-lb. boxes)		
	Total	Fresh	Processed
1963-64 through 1967-68	29,017	24,450	4,567
1968-69 through 1972-73	22,028	20,019	2,008
1973-74 through 1977-78	27,894	26,401	1,494
1978-79 through 1980-81	38,292	36,925	1,366

Table 2. Average returns to growers of Florida tomatoes for the fresh and processed markets.

Crop years	Value per 30-lb. boxes	
	Fresh	Processed
1963-64 through 1967-68	$3.06	$0.44
1968-69 through 1972-73	4.26	0.50
1972-73 through 1977-78	5.79	0.72
1978-79 through 1980-81	6.48	0.99

There is no current production of concentrated tomato products from Florida tomatoes by processors. One company in Miami imports tomato paste from Spain, Israel, and other countries. The tomato paste is used in the manufacture of catsup, puree and sauces. Their market for these products is primarily Puerto Rico and the Caribbean areas. Some product is sold to the Florida institutional market. The importation of tomato paste is economically viable due to the high value of the U. S. dollar in the international market (2). The processing facility is located in the trade free zone in Miami, so that the imported product which is exported is duty-free.

This company is proposing to build a processing plant in Homestead, FL to utilize ripe tomatoes left from the fresh market production. Ripe tomatoes from approximately 10,000 acres would be required to supply the proposed plant. Industrial development revenue bonds are now being sought by this company.

Other individuals as far back as 1976 have proposed a processing plant to utilize the ripe tomatoes from this area.

Machine harvest. The machine harvest system is similar to that used for fresh fruit recently in Florida. The machine with a crew of 1 operator, 10 sorters, 1 elevator operator, 2 tractor or truck drivers, and 1 supervisor harvests 1 row at a time. The tomato vines are cut above the plastic mulch, picked up, and separated on the shaker bed of the harvester. The fruit falls onto conveyors where sorters remove the off grade tomatoes. The elevator lifts the sorted fruit into a gondola on a truck or trailer which travels through the field along side the harvester. The machine traveling at about 1 mph with a field efficiency of 0.75 can cover about half an acre per hour.

Machine investment and operating costs for a 1200-hr (24-week) season are estimated to be about $131.45/hr. When the labor cost is included the total harvesting cost is estimated to be $206.78/hr or $382.93 per acre. With a 10 ton/acre yield, the harvesting cost would be $38.29/ton. Thus, with projected yields for salvage tomatoes, it is more economical to use hand harvest.

Tomato Concentrates and Raw Product Quality

Many factors are involved in raw product quality. Some of these are flavor, color, viscosity, and solids. The flavor of Florida grown tomatoes is good, when compared with the California processing tomatoes. The color of present Florida varieties is good (1) and should not be a limiting factor to processing. The solids content of tomatoes is very important for processing as paste, puree, or sauce. In a 1983 California tomato variety trial the mean value for 17 varieties was 5.03% soluble solids (5). In a recent study by Gull, et al. (1) the mean value for 10 Florida grown varieties was 4.25% soluble solids. Previous studies, which included production from the 1976, 1979, and 1981 seasons, gave a mean value for 9 Florida grown varieties of 4.41% soluble solids. This is a difference in soluble solids between California and Florida grown tomatoes of 0.62 to 0.78% solids, or a 14.0 to 18.3% higher solids level for the California tomato.

In the production of concentrated products (paste, sauce) the soluble solids are a major cost factor. A 0.75% difference in raw tomato soluble solids results in an 18.5% cost differential in the final tomato paste (26% solids, Table 3).

Table 3. Relative evaporation cost and yield to produce tomato paste at 26% solids per ton of tomatoes processed with various initial solids content.

Cost factor / Initial solids (%)	Evaporation load (lb. water removed per ton)	Theoretical yield (lb. product per ton)	Relative cost per unit yield (¢/lb.)[z]	Product (26%) (¢/lb.)[y]	Product (26%) Cost plus evaporation cost (¢/lb.)
5.0 (California)	1,616	384	4.2	15.63	19.83
4.5 (Florida best)	1,654	346	4.8	17.34	22.14
4.25 (Florida avg.)	1,674	326	5.1	18.40	23.50

[z]Based on estimated evaporation cost of $10.00 per 1,000 lb. water removed.
[y]Tomato costs $60 per ton.

Estimated Costs and Returns

Tomatoes—Salvage for processing.

No additional growing costs. In this evaluation (Table 4) the only additional costs are for picking and hauling. The total cost is estimated at $120 per acre with a yield of 3 tons per acre. At a price of $60 per ton (delivered basis) there is a net return of $60 per acre (Table 5).

Table 4. Estimated costs and returns for salvaged processing tomatoes, with and without additional growing costs after last fresh market harvest, Florida 1983-84 season.

Operating Costs	No input	Additional input
Seed	$ 0.00	$ 0.00
Fertilizer	0.00	0.00
Spray and dust	0.00	44.00
Cultural labor	0.00	0.00
Machine hire	0.00	0.00
Gas, oil, grease	0.00	0.00
Repair and maintenance	0.00	0.00
Interest on production capital	0.00	3.00
Miscellaneous expense[z]	0.00	15.00
Total Operating Costs	$ 0.00	$ 62.00
Fixed Costs		
Land rent	0.00	0.00
Depreciation	0.00	0.00
Licenses and insurance	0.00	0.00
Interest on investment	0.00	0.00
Total Fixed Costs	$ 0.00	$ 0.00
Harvesting and Marketing Costs[y]		
Picking	60.00	60.00
Grading and packing	0.00	0.00
Containers	0.00	0.00
Hauling	60.00	60.00
Other	0.00	0.00
Selling	0.00	0.00
Total Harvesting and Marketing Costs	$120.00	$120.00
Total Costs	$120.00	$182.00

[z]Production costs for the salvage operation are increased to reflect two additional pesticide sprays (including ethephon in one application), and one additional irrigation after the last fresh market harvest.
[y]Harvesting and market costs are based upon yields of 3 tons per acre, hand picking costs of $0.01 per lb. and hauling charges of $0.01 per lb.

Table 5. Estimated net returns per acre for various price and yield combinations for salvaged processing tomatoes assuming with or without additional growing costs after last fresh market harvest, Florida 1983-84 season.

Yield (tons)	No input		Additional input	
	$60.00	$70.00	$60.00	$70.00
2	40.00	60.00	-22.00	-2.00
3	60.00	90.00	-2.00	28.00
4	80.00	120.00	18.00	53.00
5	100.00	150.00	38.00	88.00
6	120.00	180.00	58.00	118.00

Additional growing costs. If additional growing costs of two additional pesticide sprays and one additional irrigation are assumed (Table 4), the total cost is increased to $182 per acre. At a price of $60 per ton and yield of 3 tons per acre there is a net loss of $2 per acre. If yields are increased to 5 tons per acre, there is a net return of $38 per acre (Table 5).

Tomatoes—crop grown for processing

High input levels. If tomatoes are grown specifically for processing, using high level inputs for maximum yield and hand harvest the total cost per acre is $2,935 (Table 6). If production is 20 tons per acre at price of $60 per ton a net loss of $1,735 per acre is estimated. If production is 20 tons per acre and the price level increased to $70 per ton, a net loss of $1,535 is projected (Table 7).

Table 6. Estimated costs and returns for processing tomatoes assuming either high or low input levels, Florida, 1983-84 season.

Operating Costs	Low input	High input
Seed	$ 58.00	$ 58.00
Fertilizer	261.00	522.00
Spray and dust	240.00	352.00
Cultural labor	175.00	312.00
Machine hire	32.00	32.00
Gas, oil, grease	100.00	120.00
Repair and maintenance	110.00	145.00
Interest on production capital	61.00	92.00
Miscellaneous expense	0.00	160.00
Total Operating Costs	$1,137.00	$1,793.00
Fixed Costs		
Land rent	144.00	144.00
Depreciation	75.00	75.00
Licenses and insurance	104.00	104.00
Interest on investment	19.00	19.00
Total Fixed Costs	$ 342.00	$ 342.00
Harvesting and Marketing Costs		
Picking	300.00	400.00[z]
Grading and packing	0.00	0.00
Containers	0.00	0.00
Hauling	100.00	400.00
Other	0.00	0.00
Selling	0.00	0.00
Total Harvesting and Marketing Costs	$ 400.00	$ 800.00[y]
Total Costs	$1,879.00	$2,935.00

[z]Based upon a yield of 20 tons per acre at $15.00 per ton for custom machine harvest.
[y]Based upon a yield of tons per acre and current hand harvest charges of $0.01 per lb. and contractual hauling charges which are also $0.01 per lb.

Low input levels. With low input levels for tomatoes grown specifically for processing and machine harvest, the total cost per acre is $1,879 (Table 6). If yields are 20 tons per acre and price of $60 per ton, a net loss of $679 per acre is estimated; at a yield of 30 tons per acre and price of $60 per ton a loss of $279 is projected. At a yield of 30 tons per acre and price of $70 per ton, a net profit of $21 per acre is projected (Table 7).

Table 7. Estimated net returns per acre for various price and yield combinations for processing tomatoes assuming either low or high input levels, Florida, 1983-84 season.

Yield (tons)	Low input		High input	
	$60.00	$70.00	$60.00	$70.00
10	-1,079.00	-979.00	-1,935.00	-1,835.00
15	-879.00	-729.00	-1,835.00	-1,685.00
20	-679.00	-479.00	-1,735.00	-1,535.00
25	-479.00	-229.00	-1,365.00	-1,385.00
30	-279.00	21.00	-1,535.00	-1,235.00

Tomatoes—grown for fresh market.

The projected costs for fresh market tomatoes in Dade County is $6,223 per acre (3). This includes growing,

harvesting, and marketing costs. A yield of 1,025 boxes (25 lb.) at $6.00 per box provides an estimated net return of $166 per acre. The 1,025 cartons is equivalent to 12.8 tons per acre.

Summary

The utilization of salvage tomatoes from fresh market production with no additional inputs provided the highest returns per acre of the processing production systems analyzed. Net returns of $120 per acre are projected at a yield of 6 tons per acre and a price of $60 per ton.

Production of processing tomatoes with high input levels resulted in a net loss at maximum anticipated yields per acre (30 tons) and maximum price per ton ($70).

Production of processing tomatoes with low input levels resulted in a net return of $21 per acre with maximum anticipated yields of 30 tons per acre and a price of $70 per ton.

Fresh market tomato production resulted in a net return of $798 per acre with a yield of 1,250 boxes (25 lb.) and a price of $6.00 per box.

The lower solids content of Florida tomatoes (Table 3) is an additional negative factor in the processing of concentrated tomato products.

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Proc. Fla. State Hort. Soc. 97:128-132. 1984.

THE ORANGE BLOSSOM SPECIAL: THE FIRST TWO YEARS

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Abstract. **In November 1982, the Seaboard System Railroad initiated the Orange Blossom Special (OBS), a dedicated trailer-on-flatcar train moving produce to the Northeast 6 to 7 days per week. This development was a dramatic departure from the almost passive ceding of such traffic to motor carriers in the 1970's. During that period, the railroad's share of Florida's produce movements fell from over one third to less than 1%, and many predicted complete cessation of produce traffic by rail. Now, however, the picture is radically altered. Since November 1982, the OBS has enjoyed increases in the volumes carried and the variety of commodities handled, and service levels appear to be high. In this paper the history of the Orange Blossom Special and its role in the Florida produce transportation system are detailed.**

On November 15, 1982 a major innovation was introduced in the transportation of Florida perishables—the Orange Blossom Special (OBS). The OBS is a train dedicated exclusively to carrying perishables in trailers-on-flatcars (TOFC) between Florida and Delaware. The service runs 6 to 7 days per week from late October through mid-July. Prior to November 1982, the railroads had virtually disappeared from the perishables transport scene. In this paper the events leading up to the initiation of the OBS and the history of its first two years of operation are reviewed. The implications of this service to the Florida perishables industry are assessed, and a brief view is given of the probable future course of events in Florida for rail transport of perishables.

Florida Perishables Transport 1955/56-1983/84

Modal split: 1955/56-1981/82. Since the advent of long distance trucking in the early decades of the century, the railroads experienced a steady erosion of their market share of Florida fresh fruit and vegetable (FFV) movements. By the 1960/61 crop year trucks accounted for over two thirds of surface transport of Florida FFV. Between the 1955/56 and the 1960/61 crop years the volume carried by rails fell by a third and their market share fell from 38 to 30% of surface FFV movements (Fig. 1).

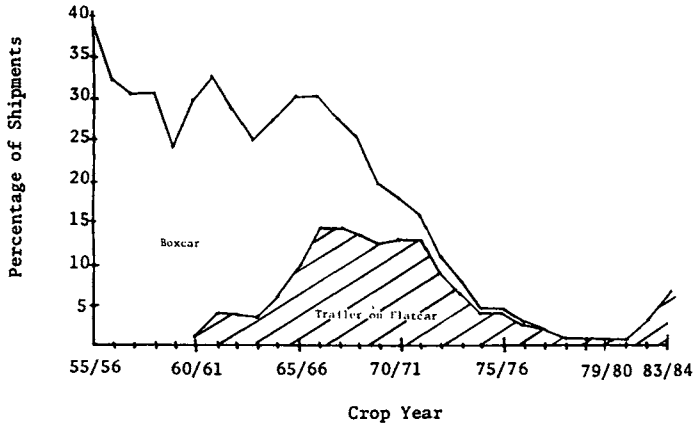

Fig. 1. Percentage of surface shipments of Florida fresh fruits and vegetables shipped via rail: 1955/56-1983/84 crop seasons. Source: Federal State Market News Service (3).

The 1960/61 crop year was also a year of opportunity for the railroads. In that year shipping FFV via TOFC was introduced. Through the 1960's TOFC shipments of FFV grew from 0 to almost 15% of the market (Fig. 1). This growth offset the continuing declines in FFV shipments via boxcar. From the 1966/67 crop year onwards, however, TOFC shipments stabilized and then declined sharply throughout the 1970's. By the 1977/78 crop year boxcar