The Citrus Industry In Cuba 1994-1999

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Abstract

This paper describes the changes in the organizational structure and land ownership in the citrus industry in Cuba as well as changes in the production and marketing of fresh and processed citrus from 1994 to 1999. Characteristics of the citrus fruits produced, varieties and rootstocks used in Cuba are also described.

Key words: Cuba, orange, grapefruit, lemon, mandarin, tangerine, varieties, juice, production, marketing, foreign investment, joint venture, organizational structure.

Preface

In the late 1980s Cuba was conducting in excess of 85 percent of its trade with the Soviet Union and Eastern Europe (*Anuario Estadistico de Cuba* 1989). Much of this trade was conducted under preferential arrangements that represented a significant source of economic assistance for the Cuban economy. The fall of the Berlin Wall in 1989 and the dissolution of the Soviet Union in 1991 resulted in a sudden loss of all of this assistance and support, which had a devastating impact upon the Cuban economy. As a result, in part, of the loss of these preferential trading arrangements, in the early 1990s Cuba entered into a process of gradual economic transition in selected areas and sectors. There has been speculation that these economic reforms, combined with other factors, may lead to a restoration of diplomatic and commercial relations between Cuba and the United States.

Prior to 1960, Cuba and the United States had extensive patterns of trade and commercial relations. In fact, a report published by the U.S. Department of Agriculture in 1942 stated "with no other country does the United States have as close economic relations as with Cuba."[1] Because of the geographic proximity of Cuba to the United States an opening of trade and commercial relations between the two countries, whenever it may occur, is likely to have important implications for many different industry sectors both in the United States and in Cuba. This is particularly true for the agricultural sector as trade in agricultural products represented very nearly half of total U.S.-Cuban trade in the late 1950s (*Foreign Agricultural Trade of the United States*. U.S. Department of Agriculture, Foreign Agricultural Service, 1957, 1958 and 1959). Given the striking similarity between agricultural production patterns in Cuba and Florida (with a heavy emphasis on sugar, citrus, vegetables, tropical fruit, as well as marine fisheries products) this is an especially significant issue for Florida's agricultural and fisheries industries.

No one knows when the U.S. economic sanctions against Cuba may be lifted. Nevertheless, agricultural producers, processors and allied industry groups in Florida and throughout the United States, as well as in Cuba, are likely to face both challenges and opportunities when the United States and Cuba do resume trade and commercial relations. In an effort to provide timely research on this potentially important policy issue, in 1992, the International Agricultural Trade and Development Center in Department of Food and Resource Economics, Institute of Food and Agricultural Sciences at the University of Florida initiated a comprehensive research project to study Cuba's agricultural and fisheries sectors. The project does ***not*** address political issues such as whether commercial relations between the United States and Cuba should be resumed. Rather, the research is designed to provide objective and current information on the agricultural and fisheries sectors in Cuba and analysis of the potential implications of a resumption of trade and commercial relations between the United States and Cuba on these sectors in both countries for Federal and State legislators, government agencies, agricultural industry associations, private firms, consumer groups and other interested parties to draw upon for discussion and debate if and when the issue may arise.

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[1] Minneman, P.G. *The Agriculture of Cuba*. U.S. Department of Agriculture. December 1942.

Beginning in 1994, and with key support from the John D. and Catherine T. MacArthur Foundation, project research was conducted via a program of active collaboration with the University of Havana's Center for Research on the International Economy (Centro de Investigaciones de Economía Internacional, or CIEI).[2]

This paper presents some of the most recent data and information available for Cuba's citrus industry in an effort to provide further insights into the competition and complementarity issues.

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[2] The U.S. Department of Agriculture's Economic Research Service also has provided financial support for domestic costs associated with the project. The support of the John D. and Catherine T. MacArthur Foundation and the U.S. Department of Agriculture has been pivotally important to the success of this project and is hereby very gratefully acknowledged.

The Citrus Industry in Cuba 1994-1999

Introduction

During the period 1992-1999, the Cuban citrus industry underwent significant change, which included the search for new markets and foreign investment partners. This change was prompted by the need of the agricultural sector to adapt to a new economic paradigm that was brought about by both internal and external forces. These forces, which included loss of preferential trade agreements with former socialist countries and the inability of large state farms to achieve high productivity, resulted in a decrease in the citrus production area of 46.8% between 1990 and 1999 and substantially reduced the rate of new planting (Table 1).

Table 1. Citrus area in Cuba.

Period	New Plantings	Removals	Ending Tree Inventory
	----------*1000 hectares*----------		
1981-1985	27.7	8.1	134.4
1986-1990	23.4	8.0	143.8
1991	0.8	3.5	140.4
1992	0.7	8.8	132.4
1993	0.6	6.1	126.8
1994	0.4	5.6	121.6
1995	0.3	6.5	115.3
1996	0.2	29.6	85.9
1997	0.5	5.9	80.6
1998	0.4	5.5	75.5
1999	0.7	8.8	67.4

Source: Compiled by the authors, using the Annual Statistics of Cuba 1989, 1996, 1997 and 1998; and MINAG 1998 and 1999.

A major change in Cuban agriculture was the development of new organizational structures in 1994, in which some of the large state farms were broken into smaller units called basic units of cooperative production (In Spanish, *Unidades Basicas de Produccion Cooperativa.* The acronym UBPC is used throughout this paper). The UBPCs were created by selling the "means of production" (but not transferring title to the land) to the workers who had previously worked for the large state farms. As can be seen in Table 2, UBPCs represented 46 percent of the citrus acreage in 1999.

Table 2. Citrus areas by type of ownership, 1999.

Variety	Area	% State			% Non state			
	1000 ha	Total	EJT[a)]	Enterprise	Total	CPA[b)]	Private	UBPC
Orange	41.5	33	30	3	67	6	13	48
Grapefruit	20.2	59	52	7	41	2	4	35
Lemon	3.6	14	10	14	86	4	8	74
Mandarin	0.8	9	--	9	91	4	20	67
Other	1.3	34	9	25	66	5	21	40
Total	67.4	37	34	3	63	5	12	46

Source: Annual Statistics of Cuba 1999; and MINAG 1999.
a) Under the control of the EJT, or Working Youth Army.
b) CPA is a production cooperative

This paper discusses recent events in Cuba's citrus industry. Information is provided on the production area by variety and market outlets for Cuban citrus, details related to production such as rootstocks and harvest season, and problems facing the industry such as diseases. Highlighted is the citrus industry's move towards increased processed utilization.

Basic Statistics on Cuban Citrus

As shown in Table 1, Cuba's citrus industry achieved a production area of 143,800 hectares in the late 1980s. With the economic crises of the 1990s, the citrus industry underwent a consolidation process which caused production area to decrease to less than 100,000 hectares in 1996 and to 67,400 hectares in 1999, a decline of more than 50%.

The 1999 citrus production area by variety is shown in Table 3. Oranges account for more than 60% of the production area, while grapefruit account for 30%. Persian limes, Eureka lemons and Dancy tangerines account for most of the other production area.

Table 3. Composition of the citrus areas by variety in 1999.

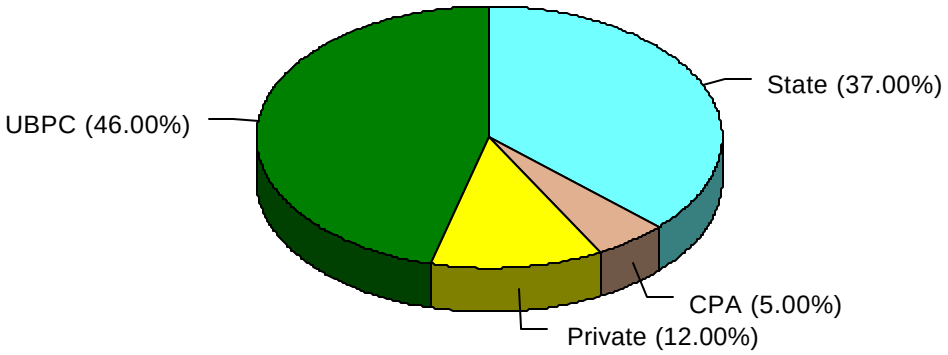
Variety	1000 hectares	%
Orange	41.5	61.6
Grapefruit	20.2	30.0
Lemon	3.6	5.3
Mandarin	0.8	1.2
Others	1.3	1.9
Total	67.4	100.0

Source: Compiled by the authors, using MINAG 1999; and the National Office of Statistics (ONE) 1998 and 1999.

Figure 1 illustrates the 1999 disaggregated citrus production area by type of ownership. UBPCs account for 46% of the production area, state farms account for 37%, private holders account for 12% and Agricultural Production Cooperatives (Cooperativas de Producción Agrícola, or CPAs) account for 5%.

Figure 2 illustrates the Cuban citrus production by variety from 1989 trough 1999. As seen in this

Figure 1
Citrus area by type of ownership, 1999



figure, citrus production peaked in1990 at more than one million metric tons (MT) and then experienced a major decline, with production reaching a low of 490,000 MT in 1994. However, with the creation of the UBPCs in 1994 and new foreign investments, total citrus production increased to more than 800,000 MT in 1999. Orange production followed a pattern similar to total citrus production. Grapefruit production remained relatively stable, ranging from 200,000 to 350,000 MT. Lime and lemon production decreased dramatically from over 60,000 MT to less than 15,000 MT and is now experiencing a modest recovery. Tangerine production which also declined is now experiencing some recovery.

Cuban citrus yields for the 1990-1999 period are shown in Figure 3 and are disaggregated by management structure (i.e., state farms versus other enterprises). Note the decline in yields for state farms between 1990 and 1994 to approximately five MT per hectare. As new organizational structures were introduced and expertise was provided by foreign partners, yields on the state farms rose dramatically and were nearly 17 MT per hectare in 1999. The rise in yields has allowed the Cuban citrus industry to achieve output levels comparable to those in the 1980s on much smaller production area.

Figure 2. Citrus production in Cuba, 1989-1999

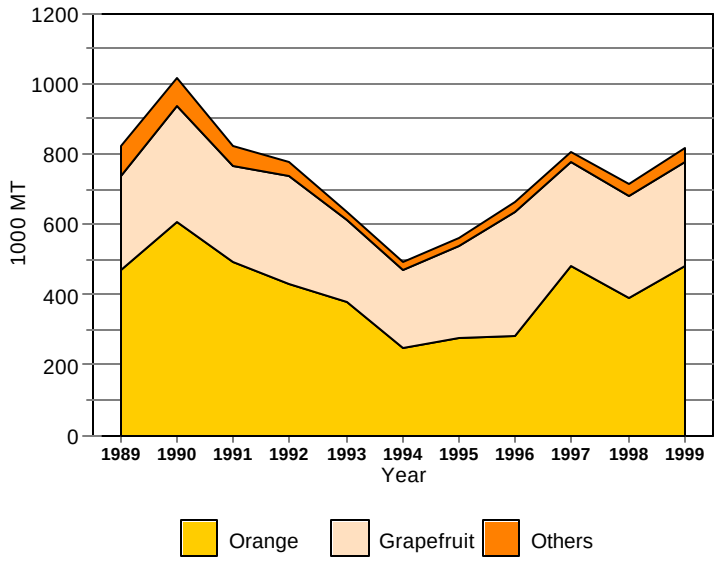
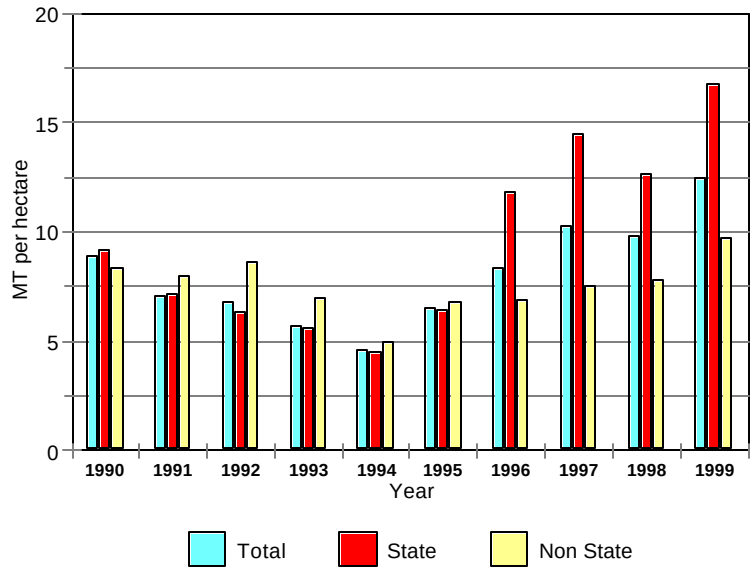


Figure 3. Citrus yields in Cuba, 1990-1999



Markets for Cuban Citrus

Table 4 shows the utilization of Cuban orange production for 1991-1999. Similar figures for Cuban grapefruit production are presented in Table 5. The marked change in Cuban citrus utilization away from fresh towards processed is a significant development. Processed orange utilization was almost 54% in 1999, compared to 44.2% in 1994. Processed grapefruit utilization was over 90% in 1999, up from 60% in 1994.

Table 4. Utilization of Cuban orange production, 1991-99.

Year	Total	Processed	Fresh			Processed	Fresh		
			Total	Exports	Domestic		Total	Exports	Domestic
			1000 MT				*As % of total*		
1991	493.3			89.0				18.0	
1992	428.4			12.0				2.8	
1993	379.0			20.6				5.4	
1994	249.0	110.0	139.0	20.0	119.0	44.2	55.8	8.0	47.8
1995	275.0	155.0	120.0	10.2	109.8	56.4	43.6	3.7	39.9
1996	283.0	170.0	113.0	12.4	100.6	60.1	39.9	4.4	35.5
1997	482.0	213.5	268.5	20.4	248.1	44.3	55.7	4.2	51.5
1998	389.0	208.8	180.2	21.3	158.9	53.7	46.3	5.5	40.8
1999	482.0	260.0	222.0	20.7	201.3	53.9	46.1	4.3	41.8

Source: Compiled by the authors, using MINAG and Citrus Caribe 1994-97, 1998 and 1999.

Table 5. Utilization of Cuban grapefruit production, 1991-99.

Year	Total	Processed	Fresh			Processed	Fresh		
			Total	Exports	Domestic		Total	Exports	Domestic
			1000 MT				*As % of total*		
1991	271.0			69.7				25.7	
1992	307.1			20.0				6.5	
1993	231.9			53.0				22.9	
1994	218.0	130.0	88.0	50.1	37.9	59.6	40.4	23.0	17.4
1995	261.0	186.3	74.7	29.0	45.7	71.4	28.6	11.1	17.5
1996	350.0	202.8	147.2	34.0	113.2	57.9	42.1	9.7	32.3
1997	296.0	211.4	84.6	17.6	67.0	71.4	28.6	5.9	22.6
1998	293.0	217.8	75.2	18.1	57.1	74.3	25.7	6.2	19.5
1999	296.0	270.0	26.0	11.2	14.8	91.2	8.8	3.8	5.0

Source: Compiled by the authors, using MINAG, and Citrus Caribe 1994-1997, 1998 and 1999.

Table 6 shows exports of fresh citrus by variety for 1991-1999. Exports of fresh oranges and fresh grapefruit declined significantly during this time. As a result of the ending of preferential trading agreements with former socialist countries, Cuban citrus lost its primary fresh export market. Cuba has been unsuccessful as an exporter of fresh citrus to the Western European markets, where Spain, Israel and Florida are the prime suppliers, and to the United States due to the U.S. economic sanctions on Cuba (Tables 4 and 5 provide the data to support this statement). Cuba has been successful in exporting orange juice and grapefruit juice to Europe, Latin America and the Caribbean countries.

Table 6. Cuban exports of fresh citrus, 1991-1999.

Variety	1991	1992	1993	1994	1995	1996	1997	1998	1999
					1000 MT				
Orange	89.0	12.0	20.6	20.0	10.2	12.4	20.4	21.3	20.7
Grapefruit	69.7	20.0	53.0	50.1	29.0	34.0	17.6	18.1	11.2
Lime	--	0.8	--	--	0.2	0.3	0.1	0.2	0.2
Total	158.7	32.8	73.6	70.1	39.4	46.7	38.1	39.6	32.1

Source: Compiled by the authors, using the Annual Statistics of Cuba 1996, 1997 and 1998; and Citrus Caribe 1998 and 1999.

The importance of citrus in generating foreign exchange is illustrated in Table 7, which shows the share of total exports attributed to citrus exports by product form. As can be seen, Cuba's citrus share of export value has ranged between 2% and 3% during the 1990s.

Table 7. Citrus exports as percent of the value of total exports, 1990-1998.

Type	1990	1991	1992	1993	1994	1995	1996	1997	1998
					%				
Fresh	2.6	2.1	0.4	1.2	1.1	0.8	0.6	0.5	0.7
Processed	0.2	0.3	0.5	0.8	1.1	1.2	1.4	1.3	1.9
Total	2.8	2.4	0.9	2.0	2.2	2.0	2.0	1.8	2.6

Source: Compiled by the authors, using the Annual Statistics of Cuba 1996, 1997 and 1998.

Table 8 shows Cuba's domestic citrus consumption. Per-capita consumption has increased from 16 kilograms to 25 kilograms during the past five years even though Cuba does not allow any imported citrus products. Its domestic citrus consumption was 34% of total production in 1999, with nearly all domestic consumption being fresh.

Table 8. Domestic consumption of citrus, 1994-1999.

Year	Total	Per capita
	1000 MT	*Kg*
1994	176.9	16.1
1995	177.1	16.1
1996	236.5	21.4
1997	338.9	30.5
1998	245.0	22.0
1999	280.0	25.0

Source: Compiled by the authors, using information from the Citrus Corporation and MINAG 1998 and 1999.

Table 9 shows per-capita consumption of citrus by variety. Oranges account for the majority of Cuba's domestic consumption. In contrast, domestic consumption of grapefruit has plunged as processed utilization for export has increased.

Table 9. Per capita consumption by variety.

Year	Total	Orange	Grapefruit	Lime	Others
			Kg		
1996	21.40	9.20	10.20	1.20	0.80
1997	30.50	21.40	6.00	1.30	0.80
1998	22.00	14.27	5.39	1.44	0.90
1999	25.00	20.20	2.00	1.52	1.28

Source: Compiled by the authors, using information from the Annual Statistics of Cuba ONE; Corporation of Citrus; and MINAG 1996,1998 and 1999.

Organizational Structures for Cuban Citrus

The four main organizational structures for Cuban citrus are UBPCs, state farms, agricultural production cooperatives (CPAs) and private farms (Figure 1). This section presents the characteristics of the CPAs and UBPCs.

The National Citrus Corporation (NCC) is responsible for directing the production and marketing of citrus from all state enterprises (UBPCs, state farms and CPAs) . All decisions regarding the selection of varieties, harvest and form of utilization for all state citrus farms are made by the NCC.

Not all of the agricultural land in Cuba, however, is controlled by the government. Small private farmers are allowed to keep small tracts of land for agricultural production. These farmers may sell their output in local markets or to the NCC.

Cooperativas de produccion agricola (CPA), or agricultural production cooperatives, were introduced in 1975. At that time private landholders were allowed to pool their land and other resources to form larger enterprises. The benefits afforded to small landholders included access to technology, production inputs and markets.

Characteristics and economic statistics of citrus CPAs are shown in Table 10. The average land area per cooperative is about 240 hectares, and the area per member is five to six hectares. Most of the CPAs were profitable during 1992-1999.

Table 10. Characteristics and economic results of the CPA.

	1992	**1996**	**1997**	**1998**	**1999**
Area (1000 ha)	3.5	3.9	3.9	3.7	3.2
Number of cooperatives	16	15	15	15	15
Area per cooperative (ha)	218	247	247	246	213
Area per member (ha)	5.0	5.8	5.8	5.8	4.8
Number of profitable cooperatives	13	14	15	15	15
Percent of profitable cooperatives	81	93	100	100	100
Cost per peso of profitable cooperatives	0.75	0.70	0.71	0.70	0.76
Cost per peso of unprofitable cooperatives	1.07	1.06	--	--	--
Average income per member in pesos/year	NA	2151	2480	2681	2462
profitable	NA	2179	2480	2681	2681
unprofitable	NA	1666	--	--	--
Average surplus per member in pesos/year	NA	514	832	800	677

NA: Not available
Source: Compiled by authors , using MINAG and other publications 1992, 1996, 1997, 1998 and 1999.

With the advent of the UBPC, there was a major shift in the organizational structure of a large proportion of the citrus production area. Before 1994, nearly 90% of the citrus production area was in large state farms. For a variety of reasons, it was determined that this was not an effective management structure for citrus crops. Therefore, the UBPCs were created by subdividing selected state farms. The new "owners" or members were those workers who had worked at the state farms. While the UBPCs were responsible for the purchase of farm equipment such as tractors, sprayers, etc.(financed through government loans), the government retained ownership of the land.

In 1999, 30,900 hectares of citrus were managed within the UBPC framework, which accounts for 46% of the citrus production area in Cuba. State farms, however, still play a major role in Cuban citrus production. The two largest state farms are Jaguey Grande and the Isle of Youth.

Characteristics of the UBPCs are shown in Table 11. In 1999, there were 91 UBPCs with an average production area for citrus of 339 hectares, with most of the UBPCs being profitable (70 of the 91). The average revenue per member in 1999 was just over 4,000 Cuban pesos, which generated an average profit of 1,252 pesos.

Table 11. Characteristics and economic results of the UBPC.

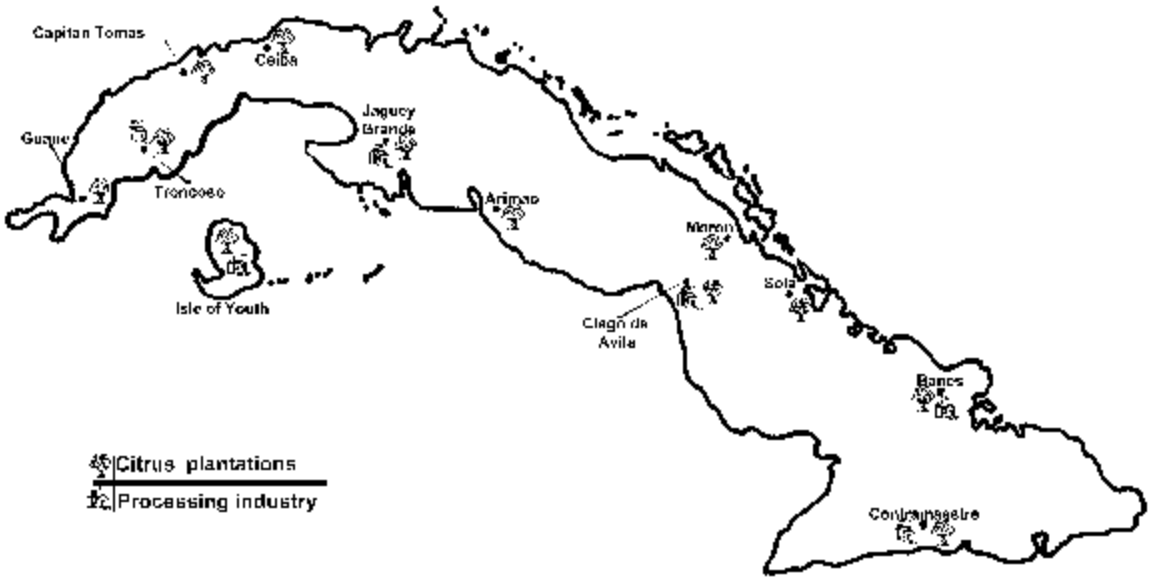
	1994	**1996**	**1997**	**1998**	**1999**
Area (1000 ha)	50.0	38.4	37.0	32.3	30.9
Number of cooperatives	62	86	89	92	91
Area per cooperative (ha)	803	447	416	351	339
Area per member (ha)	10.4	6.2	5.4	4.7	4.5
Number of profitable cooperatives	NA	41	57	77	70
Number of unprofitable cooperatives	NA	45	32	15	21
Percent of profitable cooperatives	NA	48	64	84	77
Cost per peso of profitable cooperatives	NA	0.74	0.68	0.71	0.72
Cost per peso of unprofitable cooperatives	NA	1.70	1.58	1.92	1.47
Average income per member in pesos/year	NA	3140	3801	3874	4062
profitable	NA	3550	4156	4007	4272
unprofitable	NA	2613	2838	2878	3020
Average surplus per member in pesos/year	NA	937	1319	1129	1252

NA: Not available

Source: Compiled by the authors, using MINAG and State Committee of Statistics 1994 and 1999.

Currently, there are 14 citrus enterprises located throughout Cuba. Twelve of the 14 citrus enterprises are owned by the National Citrus Corporation (Figure 4). The two largest state enterprises are Jaguey Grande, in the province of Matanzas, and the Isle of Youth, which is located off the southwest coast. The other enterprises are controlled by a collection of the UBPCs and CPAs and operate in a manner similar to a cooperative. The citrus enterprises operate the packinghouses and coordinate the harvest. The enterprises also procure inputs.

Figure 4. Citrus enterprises owned by the National Citrus Corporation



Joint Ventures with Foreign Partners

Currently, there are three active, joint citrus ventures with foreign partners in Cuba. The largest venture operates at the state farm at Jaguey Grande. The foreign partner is the B.M. Group of Israel. Recently, B.M. Group has taken over the operation of Isle of Youth, which previously was operated by the Pole Group, a Chilean company. The Chilean-based I.N.G. has a juice packing facility at Jaguey Grande and markets under the *Tropical Isle* label. A processing plant was recently opened in the province of Pinar del Rio (in the extreme western Cuba) in cooperation with the Italian company Palmara.

The Export System in Cuban Citrus

Figure 5 shows the relationship between the domestic and export markets. Production is sent, via the citrus enterprises, to either a fresh citrus packinghouse or to a processing plant. Most of the output from the processing plants is sent to the export market. The largest market for fresh fruit is the domestic market, although fresh fruit is also exported through Caribe, S.A., which is controlled by the National Citrus Corporation (NCC), and the joint ventures with foreign companies.

Figure 5. Production and Marketing of Cuban citrus

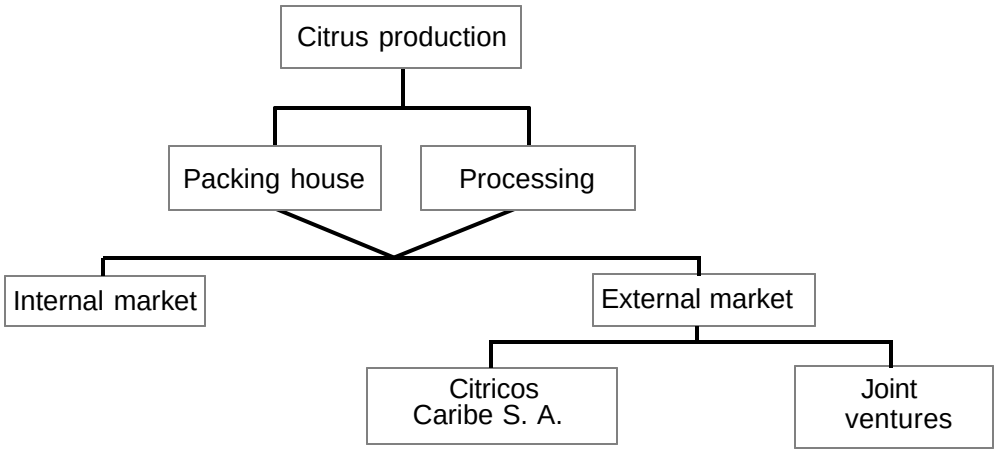
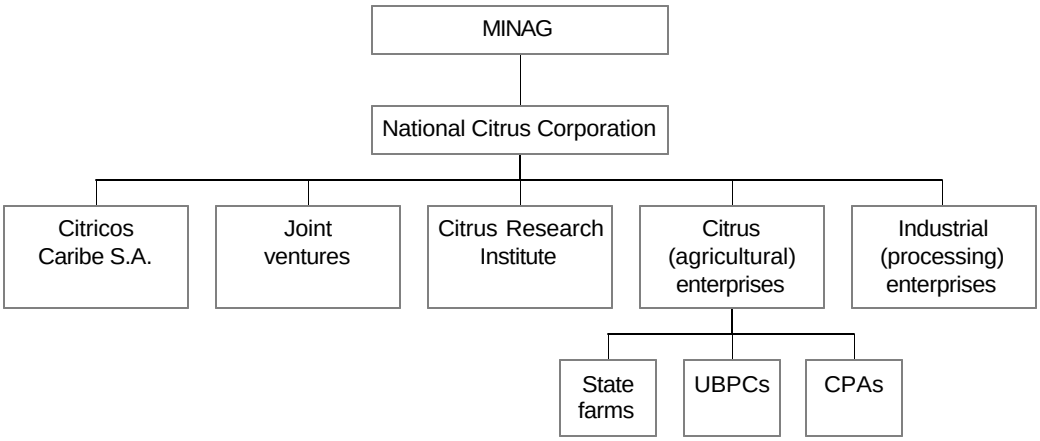


Figure 6 illustrates the organizational structure of the production and export system for citrus. Fresh citrus moves from the state farms, UBPCs, and CPAs through one of the citrus enterprises, where the decision of fresh utilization versus processed utilization is made. Research is conducted by the Citrus Research Institute under the direction of the NCC. Citricos Caribe, S.A., and joint ventures with foreign partners operate under the auspices of the NCC, which, in turn, is under the control of the Ministry of Agriculture (MINAG).

Figure 6. Structure of the citrus exporting system



Horticultural Characteristics of Cuban Citrus

Table 12 shows the rootstocks used in Cuban citrus and their tolerance to the main rootstock diseases found in Cuba such as phytophtora, blight (also known as decline), tristeza, exocortis, cachexiz and xiloporosys. Although exact figures are unavailable, over 90% of Cuba's citrus trees are planted to sour orange rootstock, which is highly susceptible to the tristeza virus. To deal with this problem, new citrus plantings use no more than 25% of a particular rootstock and no sour orange rootstock. Table 13 shows the recommended rootstocks across citrus varieties.

Table 12. Characteristics of rootstocks used in Cuba.

Rootstock	Phytoph	Blight	Tristeza	Exocortis	Cachexiz	Xiloporis
Sour orange	R	R	S	T	T	T
Cleopatra	R	R	T	T	S	T
Volkameriana	S	S	T	T	T	T
Troyer* and Carrizo	R	S	T	S	T	-
Macrophylla	R	S	S	T	S	S
Rangpur	S	S	T	S	S	-
Rough lemon	S	S	T	T	T	-
Swingle	R	S	T	T	T	T
Poncirus trifoliata	R	S	T	S	T	-

R: Resistant; T: Tolerant; S: Susceptible

* Susceptible to some lines of tristeza

Source: Integral Course of Citriculture "Citrus and Fruits Research Institute," MINAG 1995.

Note: The C-35 and the Ruby DUX are also being studied. The latter has restricting effects on tree size.

Table 13. Rootstock recommendations by variety in Cuba.

Cultivar	Cleopatra	Macrophylla	Volkameriana	Swingle
Valencia orange	X	X	X	-
Chinese orange	-	X	-	-
Persian lime	-	X	-	-
Eureka lemon	-	X	X	-
Grapefruit	X	X	-	X
Mandarins	X	-	-	-
Hybrids	X	-	-	-

Source: Technical manual for the cultivation and processing of citrus, Union of Citrus Enterprises, MINAG, 1990.

The principal citrus varieties found in Cuba are Valencia oranges, white and red seedless grapefruit and Dancy tangerines. Presented below is a discussion of the varieties produced in Cuba, along with the main characteristics of each.

Oranges

Late maturing Valencia oranges represent more than 80% of the oranges produced in Cuba. Because of the relatively warm climate in Cuba, Valencia oranges do not attain good external color, which diminishes its export potential. Several clones of commercial interest are presented in Table 14, along with quality attributes.

Table 14. Main characteristics of the Valencia cultivars in Cuba.

Cultivar	Origin	Diameter	Weight	Juice	Acidity	SST	Skin	Seeds
		mm	*g*	*%*	*%*	*Brix*	*mm*	*Avg #*
Olinda	California	74	209.6	53.9	1.17	10.6	3.1	6.4
Criolla	Cuba	72	203.8	52.2	1.13	10.3		
121	Cuba	75	221.4	51.3	1.13	10.6	4.0	2.6
Campbell	California	72	209.1	52.8	1.07	10.7	3.5	5.4
ENMC-27	Cuba	75	225.2	54.3	1.13	10.6	3.8	5.2

Source: Technical manual for the cultivation and processing of citrus and fruit trees, Institute for the Research of Citrus and Fruit Trees, MINAG, 1998.

Another important cultivar is Jardines which is a mutation of Valencia. The trees are smaller than the Valencia, with heavier fruit and fewer seeds per fruit (1 or 2 per fruit). The juice yield is similar to that of Valencia, but the acid content is lower. Jardines generally mature earlier. Other early maturing varieties such as Navel and China are not recommended for planting.

Grapefruit

Both white and red varieties of grapefruit are found in Cuba. The main white varieties are marsh seedless. These include frost marsh, marsh JBC-430 (both from California) and marsh Jibarito (Cuban selection). Following the nomenclature commonly used in the United States, red varieties include fruit with pink as well as red color.

Ruby Red has two types: Ruby Nucelar and Ruby Jaguey. Their characteristics are similar to those of marsh seedless, but are not seedless. Ruby Red's season in Cuba starts in October. Ruby Red is also found in other grapefruit producing areas such as Florida and Texas.

Star Ruby was recently introduced in Cuba and has an inconsistent production pattern. It is sensitive to phytophtora, cold weather and some herbicides such as Bromacil. Star Ruby has long been favored by Israel.

Rio Red was obtained from the Ruby Red. It has big trees, but is not susceptible to gomosis or herbicides. Rio Red is a newer variety, which was first introduced in Texas.

The characteristics of the main grapefruit varieties are shown in Table 15.

Table 15. Main characteristics of the Marsh grapefruit cultivars produced in Cuba.

Marsh	Origin	Diameter	Weight	Juice	Acidity	SST	Skin	Seeds
		mm	*g*	*%*	*%*	*Brix*	*mm*	*Avg #*
JBC-430	California	92	388.0	41.5	1.58	9.4	8.0	3.9
Frost	California	89	359.0	42.6	1.62	9.6	7.7	3.9
Jibarito	Cuba	90	354.0	42.0	1.57	9.3	8.0	4.1

Source: Technical manual for the cultivation and processing of citrus and fruit trees, Institute for the Research of Citrus and Fruit Trees, MINAG, 1998.

Tangerines

Dancy is the most widely cultivated tangerine because it is the best adapted to Cuban conditions. It is a good-sized fruit, with both good internal and external color and eight to 10 seeds per fruit. The harvest season starts at the end of October and runs through November.

Clementines are not widely produced. The fruits of Clementines are smaller than those of Dancy and have between 12 to 16 seeds per fruit.

Hybrids

Ortanique Tangor is originally from Jamaica. It is a hybrid between an orange and a tangerine, producing a late maturing fruit (coinciding with the Valencia) that is juicy and has a soft pulp.

Orlando tangelo is a hybrid between the Duncan grapefruit and the Dancy tangerine. It produces an early maturing fruit that is juicy and of good quality.

Temple, which was discovered in Jamaica, is a natural hybrid of orange and tangerine. It is a medium-sized fruit that is juicy, of excellent quality and with numerous seeds (15 to 20 per fruit).

Valentina is a cross between the Clementine tangerine and the early maturing Valencia. This is a moderately vigorous variety whose trees are wider than tall. It is an early maturing fruit that can be

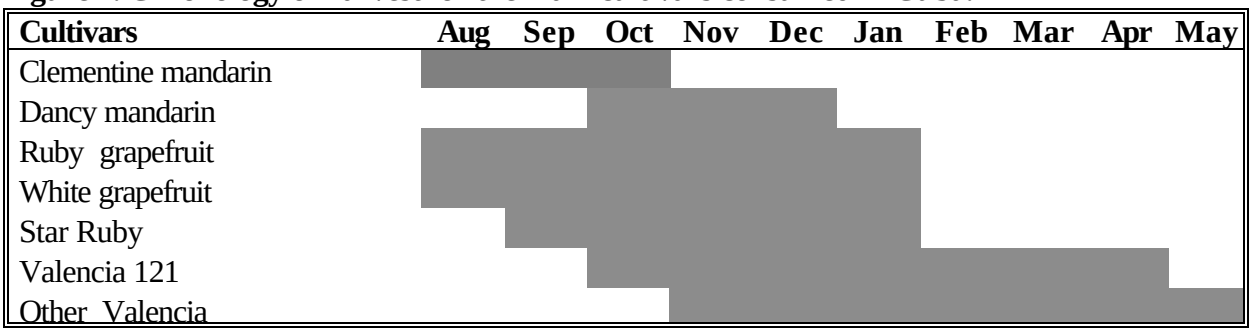
harvested from mid-September through December. The fruit becomes orange upon maturation. It has a two to three mm thick peel, an average weight of 200 to 300 grams and nine to 11 seeds per fruit. The juice has a high percentage of orange solids. This variety is being promoted because of its early maturity.

Clemelina is a cross between the Clementine and Hamlin oranges. This fruit is an easy-peeler, with a thin peel of 1.7 to 2.0 mm thick, and has a good dark orange color. The number of seeds is highly variable ranging from one to 15. The fruit produces a juice with good color and high solids, but the acid content is lower than the Valencia. The harvest period is from September to November. This variety is being promoted because of its early maturity.

Maribel probably was developed from the seeds of a Clementine crossed with a Temple. Its trees are small with dense foliage. The fruit is similar in shape to a tangerine and is an easy-peeler. This variety is early-maturing, which can be harvested in the first week of September. This is another variety that is being promoted because of its early maturity.

The typical harvest period by variety in Cuba is shown in Figure 7.

Figure 7. Chronology of harvest for the main cultivars consumed in Cuba.



Source: Technical manual for the cultivation and processing of citrus and fruit trees, Institute for the Research of Citrus and Fruit Trees, MINAG, 1998.

Acid Limes

Persian limes, also known as Tahiti limes, have the best characteristics among the acid limes. This is the most widely cultivated variety in Cuba. Its fruit is larger than the Mexican lime (also known as Key lime) and has no seeds. It is easy to harvest because the trees are relatively compact, with few thorns. The cloned SRA-58 is the main selection cultivated. Persian limes produce harvestable fruit throughout the year, with its main harvest seasons being late May through August and November through December.

Mexican limes, also called limon criollo in Cuba and Key lime in Florida, produce a small fruit. It has a high juice content, which is highly acidic and aromatic, and has many seeds. The trees generally

have many thorns which complicate the harvest. The essential oils of Mexican limes have a high commercial value.

Lemons

Eureka lemon is found in several planting areas, but its cultivation has diminished in recent years. The trees are vigorous, reaching a height of more than five meters by the age of five years. This variety is very productive, with good quality fruit and many seeds. The structure of the tree does not facilitate harvest.

Tree Density

Research has indicated that the optimum tree density spacing in Cuba is six meters between rows and four meters between trees in a row (6x4), which gives a tree density of 416 trees per hectare. Upon reaching containment size, tree size is maintained with mechanical pruning. The optimum size is 3.6 meters in width and a height of 3.6 to 4 meters. The open space between rows is 2.0 to 2.4 meters to facilitate access to labor and grove-care equipment.

Control of Pests and Diseases

New biological controls have been developed due to the restricted availability of both fertilizers and pesticides. Biological controls have the additional advantage of reducing environmental damage and increasing the number of beneficial insects.

The Processing Industry

During the 1990s, the processing industry played an increasing role in Cuba's citrus industry. Processing capacity has increased to facilitate increased processed utilization of citrus fruit. In 1999, a new processing plant with a capacity of 20 MT per hour opened in Contramaestre, in a province of Santiago de Cuba, in extreme eastern Cuba. Its main product is frozen concentrated juice. Investment capital was provided entirely by domestic sources.

Another processing plant opened in July 2000 in Troncoso, in the province of Pinar del Rio, in extreme western Cuba. This plant is a joint venture with the Italian firm Palmara. The capacity of this plant is also 20 MT per hour. It produces frozen concentrated juice.

As shown in Table 16, the addition of these two processing plants has expanded Cuba's national processing capacity to 185 MT per hour. The new processing plants also serve to geographically diversify the availability of processing capacity since existing plants were located in the central portion of the country and on the Isle of Youth.

Table 16. Industrial processing capacity by state enterprise

State enterprise	Capacity
	tons/hour
Isle of Youth	25
Jagüey Grande	80
Ciego de Avila	40
Contramaestre	20
Troncoso	20
Total	185

Source: MINAG and Citrus CARIBE 1998 and 1999

A planned expansion of the processing plant at Jaguey Grande will increase its capacity to 120 MT per hour, an increase of 40 MT. This will increase Cuba's national capacity to 225 MT hour. The proposed expansion will provide more flexibility in coordinating harvesting and processing, including the possibility of simultaneously processing two different citrus varieties. Jaguey Grande will also have the capability of producing not-from-concentrate juice with expanded storage capacity and by-product production.

Table 17 shows juice yield by processing plant and variety over the four seasons extending from 1995-96 to 1998-99. In this table, juice yield is expressed in terms of the percentage of fresh juice per unit. As would be expected, juice yield for grapefruit is much lower, compared to oranges. Juice yields at Ciego de Avila generally are higher than those obtained at Jaguey Grande. During the 1998-99 season, the new plant at Contramaestre had an orange juice yield that was considerably higher than yields obtained at all other plants during the four seasons for which data are available.

Table 17. Juice yield by processing plant, 1995-99.

Season	Ciego de Avila		Jaguey Grande		Contramaestre	Isle of Youth
	FCOJ	FCGJ	FCOJ	FCGJ	FCOJ	FCGJ
	----------%----------					
1995-96	49.08	29.12	38.88	29.10	--	29.87
1996-97	51.11	33.66	42.84	27.50	--	31.54
1997-98	49.27	32.68	43.95	26.69	--	31.76
1998-99	53.10	34.72	44.73	27.33	59.19	31.76

Source: Citrus Caribe and MINAG 1998, 1999

Conclusion and Future Prospects

The Cuban citrus industry continues its adjustment process. This process includes the abandonment of marginal production areas, new plantings, new fruit varieties, closer spacing of trees and the opening of

new processing operations and the rehabilitation of older operations. In search of profitable alternatives, Cuban citrus production has sought diversification, with emphasis on tropical fruit for both domestic and foreign markets, and identifying cultivars with desirable marketing characteristics. Also, new organizational structures have been developed and will continue to be developed in order to promote competition among various participants of the industry.

At present, the European market is the most important market for Cuban citrus. Although Latin America has not been an important destination so far, Cuban citrus is being shipped to Argentina. The Japanese market offers export opportunities for white grapefruit. The Caribbean region is viewed as a potential market for both fresh and processed oranges as well as limes.

Lifting U.S. economic sanctions would provide additional opportunities for Cuban citrus. With the near destruction of the Florida lime industry due to citrus canker infestation, there could be opportunities for lime exports, especially along the east coast; and Cuba could market grapefruit in late August, well before Florida enters the market.

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