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Competitiveness of the Orange Juice Chain in Brazil

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Abstract

This paper provides a detailed look at the orange juice production chain in Brazil including, the recent downturn of orange juice consumption seen in the global markets. This study is intended to provide more transparency and serve as a basis for deeper analysis for researchers, citrus growers, entrepreneurs and other stakeholders in the citrus industry. Looking to the future, the paper suggests a list of actions which need to be taken in order to increase the chain competitiveness.

Keywords: orange juice, production chain, global market downturn, Brazil

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Introduction

The orange juice chain is a unique commodity, since only two regions in the world are responsible for around 80% of the production—the states of São Paulo in Brazil and Florida in the U.S. São Paulo has a weather advantage because it is a hurricane free area with minimal risks of frost and drought.

Weather problems were cited as the major driving forces of growth for the Brazilian citrus industry when a frost hit the orange groves of Florida (U.S.) in 1962, which until then was the largest producer of oranges and orange juice. Consolidation of the Brazilian orange industry occurred definitively after the frosts returned to castigate Florida in the 1970s and 1980s. The union of highly developed citrus growing techniques and a competitive industry led Brazil to become the world's largest producer of oranges in the 1980s, surpassing the United States not only in production but also in citrus technology. Since then, Brazilian production has nearly doubled, and the United States has remained the second largest producer of oranges. But the U.S. is losing production year-by-year, and it currently accounts for less than half of Brazil's orange production.

Oranges produced in Brazil compete with other fruits in the vast array of consumer choices. Domestic consumption of fresh oranges is increasing, as consumers demand regularly prepared fresh squeezed orange juice in their homes, bakeries and restaurants throughout the nation—as is pasteurized juice, which is produced at factories that operate regionally. The domestic market for fresh oranges has become a major consumer of Brazil's total production. More than 100 million boxes of oranges (40.8 kg) – equivalent to approximately 30% of Brazil's production are consumed by the Brazilian population.

The biggest challenge to the production chain is in exported juice—the destination of the other 70% of Brazil's orange harvest. Orange juice is losing ground as other juices and beverages are introduced to markets with increasing frequency and steadily gain market share as they offer consumers fewer calories, lower costs, or they offer higher profit margins to bottlers and wholesale/retail networks.

Theoretical Framework

Marion Harper Jr. (1961) wrote, “To manage a business well is to manage its future; and to manage the future is to manage information.” From this sentence, the author exposes the need for decision makers to be constantly subsidized with new information which can help them develop new strategies and solutions.

An organization is defined by Bateman and Snell (2006) as a set of interdependent subsystems that is managed to transform inputs into outputs. It is an open system that interacts with the environment to select inputs which result in production. For Luhmann (2009), a feature of open systems is the ability of the structure to be modified based on the stimuli from the environment, leading to the formation of new structures.

Zylbersztajn (1995) stresses the need for a systemic approach in agribusiness, since there is a dependency relationship between the chain links and this relationship cannot be ignored. This interdependence is present in the concept of the food supply chain proposed by Folkerts and Koehorst (1997). For them, the food supply chain is a set of interdependent companies that work closely together to manage the flow of goods and services along the value-added chain of agricultural and food products, in order to realize superior customer value at the lowest possible costs. The members of these supply chains have to deal with the question of how they can best satisfy the demands of the retailers' customers and final consumers.

Since the interdependencies is not only between activities, but also between actors and the resources they use, Gripsrud, Jahre and Persson (2006) advocate that to better understand the issues related to the overall organization, as well as the actors in a distribution system, and the roles of individual companies in that context, is necessary to study the distribution arrangements from the perspective of the individual actors and also from the perspective of the distribution system as a whole. A holistic perspective must be the starting point combining insights from marketing channels and business logistics research.

Complementing the notion of interdependence between links in the chain, emerged the concept network. Omta, Trienekens and Beers (2001) define networks as agents within an industry and/or between industries that are related and potentially can work jointly seeking to add value to consumers.

Stevens (2001)(as cited in Omta et al. 2001) argues that a system that integrates the raw material suppliers, factories, distribution services and consumers is seen as a supply chain. Moreover, it is a concept network, in which organizations are directly involved in different processes that add value in the development of products and services, according to Christopher (1988) (as cited in Omta et al. 2001).

According to Neves (2013) the focus of a production system is the vertical relationships between the agents, whereas the network concept encompasses the vertical, horizontal and lateral relationships between independents agents, and therefore, a more general concept. Ménard (2002) treats the network as a hybrid form of governance and the agro-industrial system as a special case of network.

In this context, Reardon et al. (2009) showed the rapid restructuring of the agrifood industry between 1980s–2000, which included a shift from public to private standards, a shift from spot market relations to vertical coordination of the supply chain using contracts and market inter-linkages, and a shift from local sourcing to sourcing via national, regional, and global networks. This modernization was adopted to reduce costs and increase quality in order to strategically position companies in a sharply competitive marketplace.

Similarly, Shepherd (2007) emphasized the rapid transformation occurring in marketing systems, as traditional marketing channels are being replaced by coordinated links between farmers, processors, retailers and others. Moreover, consumers are becoming more demanding in terms of quality and safety and demographic and income trends are leading to increased demand for convenience foods, together with assurances of product safety. Thus, the adoption of a systemic

approach in agribusiness requires knowledge of the internal dynamics of each agricultural sector together with knowing the business environment, organizational structure and institutional environments as well.

Sonka and Hudson (1989) argued that agribusiness differs from other industries in five ways: 1) the unique cultural, institutional, and political aspects of food, domestically and internationally; 2) the uncertainty arising from the underlying biological basis of crops and livestock production; 3) the alternative goals and forms of political intervention across subsectors and among nations in an increasingly global industry; 4) the institutional framework leading to significant portions of the technology development process being performed in the public sector; and 5) the variety of competitive structures existing within and among the subsectors of the food and agribusiness sector.

Folkerts and Koehorst (1997), suggest an analytical approach to chain management that focuses on improved governance of chain strategy and activities, in reply to the change of the consumer demands that exerts an intense influence over the way the chain is structured and operates.

Given that the orange juice chain extends from the fields of Brazil to the retail segments of the world, especially—Europe and United States, this paper aims to present a more detailed analysis of the complex nature of this juice chain by providing a greater understanding of the business, variables, trends and challenges. To achieve this, the analysis is done from the perspective of the distribution system as a whole. As Gripsrud, Jahre and Persson (2006) proposed, to better understand the issues related to the overall organization. Within this context, the paper examines the needs to improve governance as recommended by Shepherd (2007) and show the restructuring of the orange juice sector is needed to survive in a sharply competitive context as commented by Reardon et al. (2009) to the general agribusiness.

Our hope is that the information presented in this study, can be useful to agribusiness managers and/or management scholars in developing new strategies for a more competitive future in this chain.

Methods

This paper utilizes a qualitative research method approach because it analyzes data from fieldwork observations, in-depth, open-ended interviews, and written documents, as Patton (2002) featured this kind of research. According to King et al. (1994), qualitative research includes a wide range of approaches, however, by definition, none of which are based on numerical measurements. The authors state that qualitative research tends to be focused on a single or a small number of cases, which makes use of intensive interviews or in-depth analysis of historical material. Although the number of cases is limited, qualitative research produces a range of information, generating a thorough understanding of the details of events or objects analyzed. Denzin and Lincoln (2011) align with the above authors and argue that qualitative research can be conducted when a detailed understanding of a particular issue is required and the solution depends on direct interviews with the people involved. Kvale and Brinkmann (2009) state that the research interview is based on the conversation of daily life and is a professional conversation, is it an inter-view, where knowledge is constructed in the inter-action between the

interviewer and the interviewee. An interview is literally an “inter view”, an inter-change of views between two persons conversing about a theme of mutual interest.

Interviews were conducted with large, medium and small companies in the orange juice chain in order to collect data and information through discussions. Some of the interviews occurred with participants attending the World Juice Conference held in Madrid, Spain in October, 2011. Other interviews were conducted with European bottlers and industrials at ANUGA held in Cologne, Germany, in October, 2011. Members of the Brazilian Association of Citrus Exporters (CitrusBR) in Brazil were surveyed through four months of immersion, by collecting individual and compilations confidentially, resulting in averages of data relating to the purchase of oranges in Brazil and sale of From Concentrated Orange Juice (FCOJ) in Europe and North America—such as the average of the production costs of orange and costs of manufacturing and worldwide distribution of FCOJ and by-products. The individual information collected from the companies were later returned in strict confidence and only the industry averages were analyzed. In addition, Tetra Pak Worldwide Center for Research and Development and Business Intelligence, in Modena, Italy, offered an immersion into global data regarding fruit juices.

Results and Discussions

Analysis of Consumption

Orange flavor stands out as the most widely consumed product among the fruit-based beverages ready for consumption. Analyzing the data of TetraPak (2013) from 40 countries representing 99% of worldwide consumption of orange flavor, one can see that the global consumption of orange juice fell -12.3% in the period from 2003 to 2012 (Table 1).

Table 1. Consumption of orange juice in the 40 top markets, grouped by continent, in 1,000 tonnes, 2003 to 2012.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Variation 2003/2012
North America	1,117	1,147	1,118	1,033	987	927	957	914	900	815	-27%
Europe	903	878	876	899	882	889	870	857	837	801	-11%
Asia	212	211	212	219	220	216	220	240	248	246	16%
Central & South											
America	93	84	88	91	92	97	103	111	119	136	46%
Oceania	60	61	63	64	66	65	64	64	64	64	7%
Africa	20	21	23	24	25	26	27	31	32	33	65%
Middle East	20	21	22	23	24	25	27	29	32	32	60%
Total	2,425	2,423	2,402	2,353	2,296	2,245	2,268	2,246	2,232	2,127	-12.3%

Consumption shown in the table does not include orange juice used in carbonated soft drinks, estimated at 70,000 tonnes of FCOJ a year.

Source. Prepared based on data from Tetra Pak Compass.

Among the 10 largest consumers, the most significant drop was in Japan, at -35% followed by Germany at -34% and then by the U.S. – by far the largest consumer market – with a decrease of roughly -29% (Table 2). The combined downturn in consumption in this three countries corresponded to a decrease of -412,000 tonnes of FCOJ equivalent in annual sales.

Table 2. Consumption of orange juice highlighting the 10 top markets, in 1,000 tonnes, 2003 to 2012.

By Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Variation 2003/2012
United States	1,002	1,029	985	924	882	826	851	807	791	708	-29%
Germany	256	231	211	213	201	199	188	188	184	170	-34%
France	152	147	153	158	163	163	168	165	159	158	4%
United Kingdom	140	136	136	138	129	140	136	135	133	126	-10%
Canada	115	117	133	109	105	101	106	107	109	108	-6%
China	44	42	48	56	60	68	74	89	102	101	130%
Russia	51	59	63	74	79	78	73	64	63	68	33%
Japan	92	97	95	95	92	76	74	75	65	60	-35%
Australia	53	55	56	57	59	58	57	57	57	58	9%
Brazil	45	37	40	41	37	38	41	45	48	55	22%
Other 30 countries	475	470	482	486	490	499	503	514	521	516	9%
Total	2,425	2,423	2,402	2,353	2,296	2,245	2,268	2,246	2,232	2,127	-12.3%

Consumption shown in the table does not include orange juice used in carbonated soft drinks, estimated at 70,000 tonnes of FCOJ a year. Data from 2003 to 2011 were reviewed by Tetrapak.

Source. Prepared based on data from Tetra Pak Compass.

Despite the decline in these major consumer markets, new facts have appeared that may represent new opportunities. There has been an increase in emerging markets, which are still relatively small and there has been a recovery in some of the traditional European markets. However, the solution could still be a long way off, because in those countries – with lower per capita income – the categories of nectars and still drinks have the strongest presence on the market. The explanation is a more affordable price to the consumer, because of the low juice content in these beverages. Along with nectars and still drinks, there are the other fruit flavors and other beverage categories, such as sport drinks, teas, coffee-based drinks, flavored milk, and flavored waters, which have experienced higher growth rates in consumption.

In 2012, the CitrusBR ordered a survey to investigate the reasons behind the orange juice decline in the global market. The study was conducted in 10 countries - Japan, U.S., UK, France, Russia, Poland, Germany, China, Norway and Canada - in which 106 experts were interviewed over six months. One finding revealed that in countries where there is growth in consumption, juice is positioned as a liquid healthy-food, nutritious, tasty and fresh. The idea of health is very important because it comes from a long held belief that it's important to consume vitamins especially in the winter (Pinto and Maresca 2012).

Another finding from the study revealed that the nutritional benefits of orange juice are usually remembered by the elderly. Since they experienced periods of war with scarce of food, juice was considered at that time to possess a full glass of energy and vitamins. But awareness of this

benefit was lost in subsequent generations, which suggests that it is one of the reasons for the drop in consumption. Overall, the results of the survey showed that (Pinto and Maresca 2012):

- orange juice is losing market share compared to other drinks: water (plain and flavored), teas, juice blends and fruit-based drinks;
- the issue of obesity is very serious and juice is being positioned as one of the villains;
- government and experts such as nutritionists and doctors are now recommending that patients eat the whole fruit instead of just the juice;
- a variety of innovative beverages have entered the marketplace;
- market positioning has had an impact on the reasons to consume. Juice is positioned for its freshness and flavor, competing with several other drinks in the same segment.

Retail

In countries that are major consumers of orange juice, sales are concentrated among very few retailers. This increases the bargaining power and suppression of prices and decreases alternative distribution channels for orange juice on the part of bottlers, according to European bottlers interviewed for this study. Table 3 shows that the participation of five largest retailers in food sales, by country, has been growing year- after-year.

Table 3. Market share of the five largest retailers in food sales in selected countries, 2000 to 2010.

Countries	2000	2005	2010
Israel	99.3%	99.5%	100.0%
Switzerland	80.7%	85.1%	92.1%
South Korea	58.5%	72.3%	84.4%
Austria	72.5%	71.9%	84.4%
Germany	66.4%	72.9%	80.0%
France	70.0%	64.8%	74.7%
Russia	60.9%	55.1%	74.4%
Canada	60.6%	54.8%	73.7%
Japan	66.6%	63.4%	66.5%
Spain	52.7%	56.7%	69.2%
United Kingdom	50.6%	59.8%	67.9%
Italy	69.6%	67.5%	67.1%
Poland	51.4%	41.6%	53.2%
United States	42.7%	45.3%	46.3%
Brazil	41.0%	40.5%	43.0%

Includes only modern food distributors; does not include small neighborhood retailers.

Source. Prepared based on data from Planet Retail and Abras.

Another interesting aspect of retail is the strategy for reducing retail costs and expenditures is the adoption of own brands, the so-called private labels or white brands. This type of product is systematically gaining ground on the market in relation to the traditional brands, since, in the developed nations, they offer the same standard of quality at a lower price. Consequently, manufactures of traditional brands are putting enormous pressure on all the links in the chain in order to ensure the market competitiveness of their products.

Price levels in 2011 – according to estimates by the bottlers– a retailer's net earnings are at least 0.10 euro for each 1-liter package of orange juice sold, that the conversion rate euros to dollars, 2011, makes the retailer's net margin reach US\$ 761 per tonne of FCOJ 66° brix equivalent. Therefore, according to the interviewees, over 70% of the profit margin in the productive chain is earned by retailers, while the remaining 30% of profit margin remains for the bottlers, processors and growers.

Therefore it is necessary to strengthen the position of orange juice in alternative channels, and within retail, to deal with the rising costs of the production chain, in order to maintain sustainability. It is also necessary for the product to have higher added value, so it can be sold at higher prices.

Bottlers

Bottlers companies that purchase Brazilian orange juice (FCOJ or Not From Concentrated - NFC), for use in their drinks with different blends and brands, have far-reaching consequences. Since Brazil exports 95% of its production (comparing production data from CitrusBR and exports data from the Brazilian Department of Foreign Trade at the Ministry of Foreign Development, Trade and Industry (SECEX/MIDC)), the country is highly dependent on these bottlers located abroad, and their successful bottling, distribution and marketing campaigns. Without bottlers, the orange juice produced in Brazil couldn't reach the supermarket shelves and thus be available to consumers. The bottlers are largely responsible for stimulating orange juice consumption.

The investments required for the construction and commissioning of these bottling plants are significant, and almost all of them throughout the world also bottle various types of fruit juices and other types of beverages such as non-carbonated and carbonated soft drinks.

In recent years, the beverage market has gone through a strong period of consolidation (Figure 1). According to CitrusBR, just 30 bottlers purchase and bottle the equivalent of 71% of the orange juice produced worldwide. Out of this total, the 10 largest orange juice bottlers account for 52% of the entire market. Today the better part of distributed juice is done by multi-product companies, where orange juice is just one more item from their large portfolio of beverages such as juices, nectars and non-carbonated soft drinks made from other fruit flavors; bottled waters; soft drinks; energy drinks; milk-based beverages; and other non-alcoholic beverages that invariably channel more marketing investments, giving more attention and priority to the categories of beverage production that offer the best profit margin at any given time.

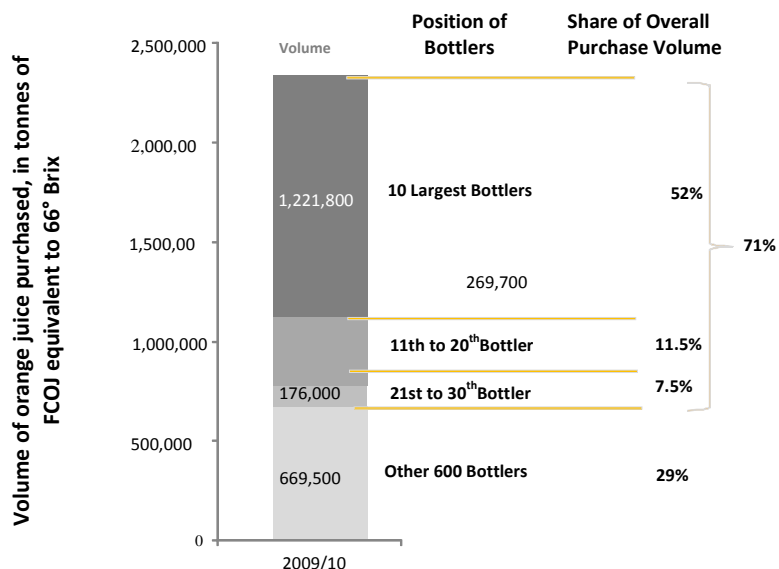


Figure1. Concentration of bottlers in the acquisition of orange juice around the world, 2009/10.
Source. Prepared based on data from CitrusBR.

Brazilian Industry

According to data from Foreign Agricultural Service (FAS) of United States Department of Agriculture (USDA), the global production of orange juice has decreased over the last few years and was below consumption in the 2008/09 season, according to data from Tetra Pak. In the last 15 seasons, from 1995/96 to 2009/10, the drop in worldwide production of juice was 13% (equivalent to 308,000 tonnes), with the largest reductions occurring in Florida (295,000 tonnes) and in the citrus belt of São Paulo (31,000 tonnes). Despite such decreases, these regions continue to lead world production of orange juice, accounting for 81% of all production.

Brazil is the largest producer and exporter, responsible for 53% of world production and exporting roughly 95% of this production.

In 2012, exports from the Brazilian citrus complex totaled 2.1 million tonnes of product and US\$ 2.6 billion in revenue, representing about 3% of Brazilian agribusiness exports (Table 4). The devaluation of the US dollar, coupled with rising costs from numerous stakeholders along the supply chain, caused the average cost of processing oranges to rise 224% over the period from 2003 to 2010, jumping from US\$ 347.54 to US\$ 534.28 per tonne of FCOJ.¹

¹The cost of processing oranges was provided by CitrusBR.

Table 4. Exports from the Brazilian citrus complex, 2001-2012.

Year	Value (FOB)		Volume	
	Total exports from the citrus complex (US\$ million Total)	Processed products		Fresh oranges - Volume Exported (Thousand 40.8-kg box)
		FCOJ & NFC Conv. 66° Brix (Thousand Tonnes)	Other products & derivatives (Thousand Tonnes)	
2001	US\$ 986	1,348	1,261	3,421
2003	US\$ 1,375	1,362	1,015	1,667
2005	US\$ 1,273	1,403	929	751
2007	US\$ 2,507	1,416	962	1,219
2009	US\$ 1,839	1,301	851	642
2011	US\$ 2,722	1,155	435	816
2012	US\$ 2,593	1,097	405	539

Source. Prepared based on data from SECEX/MIDC.

Orange juice is a commodity with high volatility in production and prices, in contrast with a virtually constant demand (Figure 2).

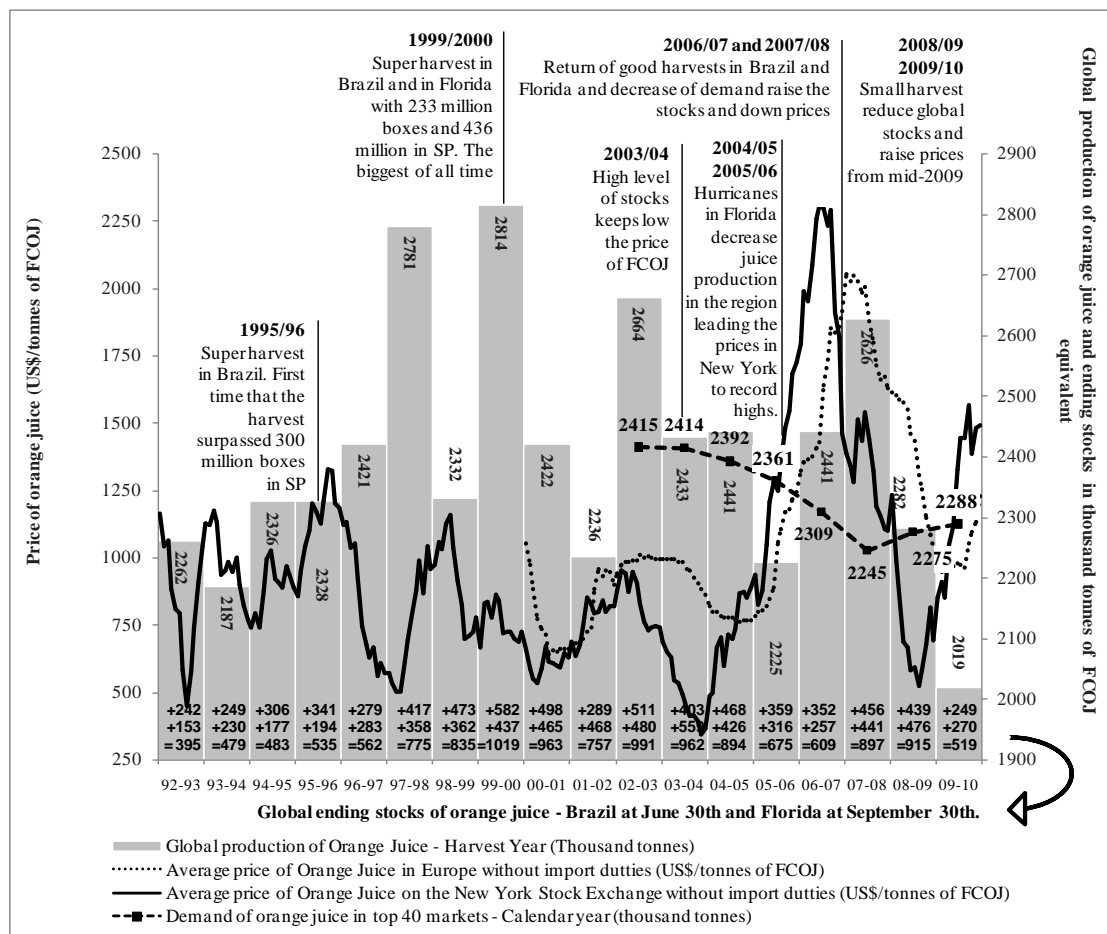


Figure 2. Global production of orange juice, ending stocks and impact in prices at New York Stock Exchange and at physical market in Europe.

Source. Prepared based on data from CitrusBR, USDA, Foodnews, Tetrapak.

From one year to another, the difference in production reached 40% in the last seven years analyzed. Moreover, when observing the behavior of demand, the movements are much less abrupt and do not exceed 3%. In summary, the fact that 80% of world production is concentrated in São Paulo and Florida are the indices of productivity of orchards responsible for the great variability in the volume of orange juice being produced and offered to the market. These variations in short time period have caused the price of FCOJ to become highly volatile, causing great disturbances in the economic production chain. During this period there was a wide range of price fluctuation in the physical markets of Europe, ranging from an average of US\$ 712 per ton of FCOJ in January 2001 to US\$ 2,230 per ton of FCOJ in July 2007. In the New York Stock Exchange there was even greater amplitude. In May 2004, orange juice hit the floor with a daily average closing price of US\$ 0.56 per pound solids—equivalent to US\$ 396 per ton of FCOJ equivalent, tax free. In December 2006, it reached the roof with average daily closures of US\$ 2.0123 per pound in solids, an equivalent to US\$ 2,432 per ton of FCOJ equivalent, tax free.

The average prices without import duties shown in the graph were calculated based on the historical (averages) monthly deliveries of FCOJ to marine terminals in Europe as reported by the associates of CitrusBR. This is compared with historical sales (final prices) of FCOJ to bottlers. The prices were averaged without import duties and anti-dumping duties in the North American market and were calculated based on the average daily closing price and monthly sales of FCOJ in the New York Stock Exchange.

According to the interviews, the dynamics of the sector is influenced by several events:

- Climatic variability strongly impacts the volume of annual global production and global inventories of orange juice at the end of each growing season (carry-over stocks).
- The demand for orange juice, according to data from Tetra Pak, has shown slight changes in consumption from year to year, relatively independent from the amount of orange juice offered on the global market, since the final prices on store shelves undergo little change.
- The accentuated volatility of orange juice prices on the New York Stock Exchange and on the physical market in Europe is due to expectations of production and carry-over stocks of subsequent harvests.
- The increased firepower of retailers in a scenario of excess idle capacity on the part of juice bottlers (now estimated at more than 50% in Europe and roughly 30% in North America) causes negative pressure on selling prices to bottlers.
- The excess supply of orange juice to a small and increasingly concentrated portfolio of bottlers, which are idle and crushed by the retailers in turn, also causes negative pressure on selling prices of FCOJ from the orange juice producing industries, particularly in times of large harvests and oversupply of orange juice on the world market.
- In spite of a direct correlation, one can also see a natural lag between the monthly average quotes on the New York Stock Exchange and the average prices received by the industries on the European physical market, the main destination of Brazilian exports. Such lag stems from the fact that contract prices in Europe and Asia are

locked with bottlers for periods ranging from 6 months to 24 months, instead of the futures market that has low liquidity in periods longer than 6 months in the future.

As with other sectors in the world economy, the Brazilian citrus industry has been consolidating itself over time. This type of concentration is also witnessed in other sectors of Brazilian agribusiness, such as in beef and pork products, pulp and paper, sugarcane and chicken, among others. This trend is also present in the banking, automobile, mining and retail sectors. The consolidation of processors is justified by the quest for gains in efficiency generated by the economy of scale, such as, the dilution of fixed costs, and possibilities for setting up an efficient system for bulk storage and maritime shipping, as well as access to capital at competitive rates. However, the consolidation of processors does not happen in isolation, there are the links before and after the juice industry. The concentration of retailers is significant. In Germany, for example, the five top retailers control 80% of the sales of non-alcoholic beverages. In turn, the juice bottlers, who are direct customers for the orange juice exported by Brazil, follow the same path. According to CitrusBR, just 35 bottlers buy up 80% of the world's production of orange juice nowadays, with the remaining 20% being bought by around 565 bottlers. Following the same trend, the Brazilian orange producers and seeking gains in efficiency as a result of greater scale, the Brazilian orange producers have been swiftly consolidating—2% of them already own 55% of the trees in the citrus belt.

Producers

Orange growing is present in all Brazilian states. According to IBGE (Brazilian Institute of Geography and Statistics), oranges are the most widely grown fruit in the country occupying more than 800,000 hectares of crop land. Orange groves are expanding outside the state of São Paulo, which now accounts for 70% (2009/10) of the overall area cultivated. Although there has been growth in the area of orange groves in these regions, the total area dedicated to orange growing in Brazil has dropped by around 8% since the early 1990s. This decrease has not been accompanied by a reduction in the amount of boxes harvested. On the contrary, there has been a 22% increase. This inversion is the result of an impressive gain in productivity. The national average of 380 boxes per hectare, in 1990, jumped to 475 boxes per hectare by 2010. If today's citrus industry were the same as existed 20 years ago, it would take nearly 280,000 hectares more to reach today's production levels (Neves and Trombin 2011).

Some problems can also be seen in the orange production in Brazil, including rising production costs, as well as pests and diseases, which are decreasing profit margins of growers. The average operating cost of producing 100% of the oranges produced by industries in each growing season from 2000/01 to 2009/10 has been calculated. Table 5 represent the operating cost of producing around 35% of the oranges processed by industries in the state of São Paulo which come from their own orchards scattered throughout the citrus belt.

Table 5. Average operating cost of orange production of industry-owned orange groves (40.8-kg box)

Breakdown of production costs of company-owned orchards	2000/01	2009/10
Wages, comp. & fac. expenses, ppe ¹ , outsourced manpower	US\$ 0.30	US\$ 0.91
Pesticides and herbicides	US\$ 0.39	US\$ 0.49
Fertilizers (organic/chemical fertilizers, and soil additives)	US\$ 0.22	US\$ 0.41
Electricity	US\$ 0.03	US\$ 0.06
Expenditures on company-own vehicles and third-party services	US\$ 0.21	US\$ 0.17
Maintenance, servicing, and other expenses	US\$ 0.06	US\$ 0.17
Total expenditure on the trees	US\$ 1.21	US\$ 2.21
Harvest (wages, com. & fac. Expenses, nr 31, ppe)	US\$ 0.36	US\$ 1.19
Fruit Shipping Costs (Internal Removal, Shipping to Factories and Tolls)	US\$ 0.16	US\$ 0.56
Total costs ex-factory	US\$ 1.74	US\$ 3.96

¹- Personal protective equipment.

Source: Prepared based on data from CitrusBR.

The analysis of operating production costs for the industry-owned orange groves for the ten-year period from 2000/01 to 2009/10, reveal that the cost of harvesting and shipping rose from 30% to 44% of the overall operating cost of orange production.

The higher costs of orange production underscores the need to rethink the management of citrus enterprises by adopting some solid production planning, long-term objectives and targets as well as implementation and allocation of resource strategies in order to achieve such goals. It is also important for the government to collaborate in this rethinking of production activity, and integrate future actions because of this sector's importance in generating jobs and income.

In citrus farming, there is a pressing need to increase productivity, in such a way as to reduce production cost per box of oranges. In order for there to be profitability by sending the fruit to industrial processing, there needs to be scale production, as well as compliance with relevant labor and environmental legislation. These requirements are more easily met by larger farms that use high technology and generally have an ideal size for a proper dimensioning of equipment, as well as stronger purchasing power for supplies. However, 87% of the growers in Brazil's citrus belt are small-scale growers (11,011 producers), producing on farms with fewer than 20,000 trees (fewer than 40 hectares). This group of producers owns only 21% of the total number of trees in the citrus belt (Table 6).

In 2009, 44% of the overall area planted in the citrus belt exhibited yield below what is necessary to turn a profit. An average of 280 boxes per hectare is produced in this area. This is a major difference when compared to the other properties that make up the other 56% of orange grove acreage, which on average produce 909 boxes per hectare (see Table 7).

Table 6. Stratification of growers in the citrus belt, by number of trees, 2001 and 2009.

Parameter	2001			2009		
	Trees (%)	Growers (%)	Number of Growers	Trees (%)	Growers (%)	# of Growers
> 400,000 trees	16.15	0.15	23	39.25	0.4	51
200,000 to 399,000 trees	7.65	0.25	38	7.35	0.55	69
100,000 to 199,000 trees	10.6	0.7	105	8.95	1.3	164
50,000 to 99,000 trees	12.4	1.75	263	10.75	2.95	372
30,000 to 49,000 trees	12.3	3.15	473	7	3.5	442
20,000 to 29,000 trees	8.95	3.9	585	5.3	4.1	518
10,000 to 19,000 trees	16.45	14.5	2.175	8	11.15	1.408
< 10,000 trees	15.45	75.55	11333	13.4	76.05	9603
Total	100.00%	100.00%	15.000	100.00%	100.00%	12.627

Source. Prepared based on data from CitrusBR.

Table 7. Stratification of orange production per range of yield in the 2009/10 growing season.

Range of Productivity	% of area (hectares)	% of boxes	Volume of boxes produced per range of yield	Yield (average boxes per hectare)
Over 1,400 boxes per hectare	2%	5%	16 million boxes	1,655
from 1,100 to 1,399 boxes per hectare	7%	13%	41 million boxes	1,209
From 800 to 1,099 boxes per hectare	19%	29%	92 million boxes	933
From 500 to 799 boxes per hectare	28%	30%	95 million boxes	639
From 200 to 499 boxes per hectare	36%	21%	67 million boxes	345
Below 200 boxes per hectare	8%	2%	6 million boxes	138
Total	100%	100%	317.4 million boxes	607
Total over 500 boxes per hectare	56%	77%	244.4 million boxes	909
Total boxes below 499 per hectare	44%	23%	73 million boxes	280

Source. Prepared based on data from CitrusBR.

This dynamic taking place in the Brazilian citrus industry explains why less efficient producers are unable to compete with more efficient ones, and have therefore, left the sector to focus on other crops. Those who remain in the citrus-growing business must find a more appropriate path for each of properties, i.e., a new strategy to run their farms, which could consist of cost leadership, differentiation, or diversification.

In addition to the cost of production, pests and diseases affect citrus production in Brazil and, undoubtedly, are a major threat to the nation's citrus industry. During the last decade, four diseases were responsible for the eradication of 39 million trees in the citrus-growing centers of São Paulo. Thus, the average annual rate of mortality, which previously hovered around 4.5% a year, jumped to 7.3%. Adopting an average yield of two boxes of oranges per tree, it is estimated that citrus canker (CVC), sudden death, and citrus greening were responsible for an annual reduction of around 78 million boxes, compared to the 317 million boxes harvested in 2009/10, representing a decrease in harvest of roughly 20%.

Conclusions

This paper has provided a detailed analysis of the complex nature of the orange juice chain, providing a greater understanding of this business, as well as the variables, trends and challenges.

Given this analysis, it is possible to see that the orange juice chain changed considerably. The changes seen throughout the productive chain have the same origin: an understanding that the end consumer does not want to and will no longer pay for the inefficiencies in the chain of supply. The demands of this new order have imposed challenges that cannot be met under the pretext of an isolated and static system. Only coordination of the chain as a whole and the incessant quest for efficiency and low costs will be able to boost the performance of all the links that make up the chain.

Probably, the orange juice sector will not realize the same future growth as other important sectors of Brazilian agribusiness. An important question for discussion is how to sustain the current market share. The answer is complex, but the authors present a series of steps that need to be taken and which have managerial implications:

1. Concentrate on marketing efforts aimed at recovering the loss of product consumption in major downturn markets;
2. Invest in development aimed at emerging markets involving industries; CitrusBR and the Brazilian agency to encourage exportations trade and investment in a promotion agency (APEX-Brazil);
3. Redeem consumers traditional values and repositioning orange juice as a liquid food;
4. Diversify distribution channels and efforts to development the brand "Drink Brazil", creating intimacy with the final consumer;
5. Support strategies to create a consumer pull effect through establishing one communication program working on one brand positioning for juice orange produced in Brazil. Such a mark could be used by bottlers international in order to add value to the product;
6. Develop of the domestic market;
7. Strengthen the representative associations to enrich the debate in favor of uniting the links in the productive chain;
8. Disseminate the best practices for agricultural management aimed at increasing the productivity and competitiveness of the chain;
9. Support citrus growers in technical and financial issues.

Additionally, it is necessary to create governance in order to establish the references, operating costs, and capitalization necessary to enable the identification of benchmarks for an equitable distribution from the results obtained through the production chain and exporters of orange juice. With this governance in full operation, the time and energy spent on settling disputes in the supply chain will be invested in the reconstruction of the entire sector, adding value aimed at the collective national interest in all aspects. It is believed that this contribution is important in this crucial time for the orange juice chain.

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