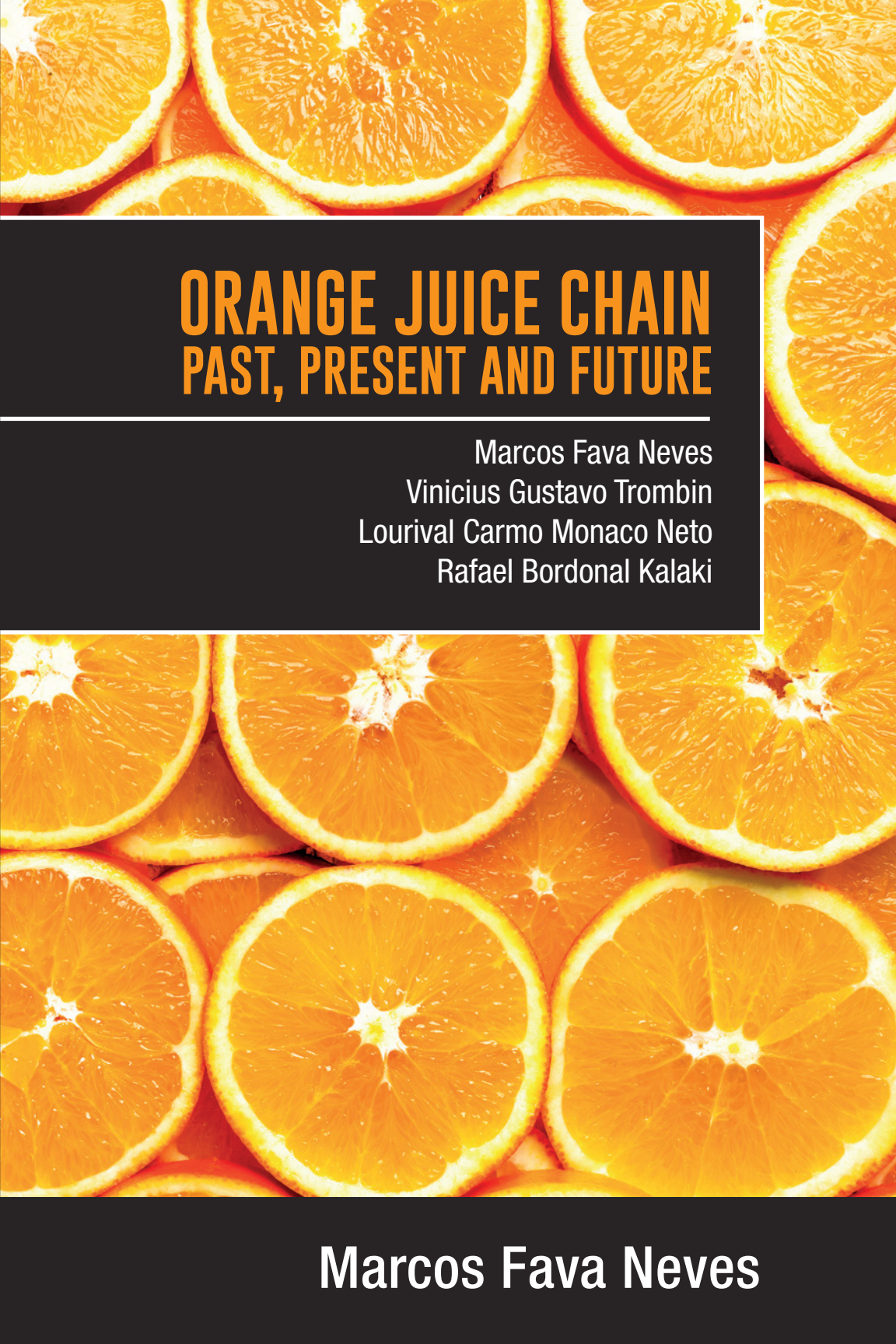

ORANGE JUICE CHAIN
PAST, PRESENT AND FUTURE

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KAAP AGRI
Citrus Growers' Association OF SOUTHERN AFRICA

We would like to dedicate this book to Prof. Dr. Evaristo Marzabal Neves, from ESALQ/USP, the precursor of Citrus Economic Studies in the Brazilian University System, and academic advisor to all authors.

ABOUT THE AUTHOR

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He has extensive experience in agronomic engineering, exports, biofuels, management, and agribusiness, with a specialization in strategic planning specialization for companies and food chains.

In addition to sitting on the boards of numerous global and local public and private organizations, he co-founded the Markestrat think tank in 2004 which today employs around 60 people running influential international projects, studies and research in strategic planning and management for more than 250 agri-food business organizations. Many of these have been implemented in Brazil with successful economic and social impacts.

Marcos has materially influenced thousands of academic studies and qualifications, having advised more than 30 doctorate dissertations and master's theses. He is also one of the most active Brazilian speakers, having given more than 1,050 lectures and presentations in 25 countries. He has received around 150 recognitions from Brazilian and international organizations, and has been considered a "Fellow" of the International Food and Agribusiness Management Association since 2015.

Recognized as the most prolific Brazilian academic with the largest number of international publications about the orange juice and sugar cane chain, and one of the most cited Brazilian authors in the area of food and agribusiness,

his work strongly focuses on supplying simple and effective methods for business. He has published more than 100 articles in international journals and has been author and editor of 63 books by 10 different publishers in Brazil, Uruguay, Argentina, South Africa, Singapore, Netherlands, China, the United Kingdom and the United States. He is also a regular contributor for China Daily Newspaper and has written case studies for Harvard Business School (2009/2010), Purdue (2013) and Pensa/USP.

Coming from a family of farmers, he is a worldwide defender of agriculture and farmer's role in the development of society. Together with his parents, Marcos is one of the creators and maintainers of Mucapp, a non-governmental organization that in 20 years has built more than 450 houses for families in Brazil facing difficult conditions.

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1

COMPETITIVENESS OF THE ORANGE JUICE CHAIN IN BRAZIL[1]

1.1 Introduction

The orange juice chain is a unique commodity. Only two regions in the world are responsible for about 80% of the production – the states of São Paulo in Brazil and Florida in the United States. As a hurricane-free area, São Paulo has a weather advantage, with minimal risks of frost and drought.

Weather problems in other parts of the world have been cited as the major driving force behind the growth of the Brazilian citrus industry. In 1962, frost hit the orange groves of Florida (United States) which, until then, had been the world's 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.

A union with highly developed citrus-growing techniques as well as a competitive industry, led the way for 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 US is losing production year on year, and it currently produces less than half of what Brazil produces.

Oranges produced in Brazil compete with other fruits amid a vast array of consumer choices. Domestic consumption of fresh oranges is increasing, as

1 Published in 2013 in the *International Food and Agribusiness Management Review*.

consumers demand fresh-squeezed orange juice in their homes, bakeries and restaurants throughout the nation. Pasteurized juice is produced in regional factories. The domestic market for fresh oranges has become a major consumer of Brazil's total production. More than 100 million boxes of oranges (40.8kg) – equivalent to approximately 30% of Brazil's production – are consumed by the Brazilian population.

The biggest challenge to the production chain lies in exported juice – the destination of the other 70% of Brazil's orange harvest. However, orange juice is losing ground, as other juices and beverages are increasingly being introduced to markets and are steadily gaining market share, offering consumers fewer calories and lower costs – or higher profit margins to bottlers and wholesale/retail networks.

1.2 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." In this quote, the author exposes the need for decision-makers to be constantly provided with new information that can help them develop new strategies and solutions.

An organization is defined by Bateman and Snell (2006) as a set of interdependent subsystems that have managed to transform inputs into outputs. It is an open system that interacts with the environment to select inputs that 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 to agribusiness, since there is a dependent relationship between the links of this chain – 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 these interdependencies are 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, it is necessary to study the distribution arrangements from the perspective of the individual actors – and from the perspective of the distribution system as a whole. A holistic perspective must be the starting point that combines insights from marketing channels and business logistics research.

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

In this context, Reardon et al. (2009) showed the rapid restructuring of the agrifood industry from 1980–2000. This included a shift from public to private standards; a shift from spot market relations to vertical co-ordination of the supply chain using contracts and market interlinkages; 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 co-ordinated 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 to agribusiness requires knowledge of the internal dynamics of each agricultural sector, together with a knowledge of the business environment, organizational structure and institutional environments, too. Sonka and Hudson (1989) argue that agribusiness differs from other industries in five ways:

1. The unique cultural, institutional, and political aspects of food, both 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.
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 the improved governance of chain strategy and activities, in response to the change in 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 the 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 conducted 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, this paper examines the need to improve governance, as recommended by Shepherd (2007). It reveals that a restructuring of the orange juice sector is needed to survive in a sharply competitive context, as indicated by Reardon et al. (2009) to the general agribusiness.

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

1.3 Methods

This paper utilizes a qualitative research method approach. It analyzes data from fieldwork observations, in-depth, open-ended interviews, and written documents, as featured in the research by Patton (2002).

According to King et al. (1994), qualitative research includes a wide range of approaches. However, by definition, none of these are based on numerical measurements. The authors state that qualitative research tends to be focused on a single or small number of cases, which makes use of intensive interviews or the in depth analysis of historical material. Although the number of cases is limited, qualitative research produces an array 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. 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. It is a professional conversation – an interview in which knowledge is constructed during the interaction between the interviewer and the interviewee. An interview is literally an "inter view", an interchange of views between two persons conversing on a theme of mutual interest.

In order to collect data and information through discussions, interviews were conducted with large, medium and small companies in the orange juice

chain. Some of the interviews occurred with participants who attended the World Juice Conference in Madrid, Spain, in October 2011. Others were conducted with European bottlers and industrials at the ANUGA Food and Beverage Fair, held in Cologne, Germany, in October 2011. Members of the Brazilian Association of Citrus Exporters (CitrusBR) were surveyed through four months of immersion, in which individual and compilation inputs were collected confidentially. This resulted in the collection of averages of data relating to the purchase of oranges in Brazil, and the sale of From Concentrated Orange Juice (FCOJ) in Europe and North America. For example, the average production costs of oranges, the costs of manufacturing, and the worldwide distribution of FCOJ and by-products. The individual information collected from the companies was later returned in the strictest of 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.

1.4 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 Tetra Pak (2013) from 40 countries representing 99% of worldwide consumption of the orange flavor, one can see that the global consumption of orange juice fell -12.3% in the period from 2003 to 2012 (Table 1).

Among the 10 largest consumers, the most significant drop was in Japan, at -35%, followed by Germany at -34% and then by the US – by far the largest consumer market – with a decrease of roughly -29% (Table 2).

The combined downturn in consumption in these three countries corresponded with a decrease of -412,000 tonnes of FCOJ equivalent in annual sales.

Despite the decline in these major consumer markets, new facts have arisen that may represent new opportunities. There has been an increase

TABLE 1: Consumption of orange juice in the 40 top markets, grouped by continent, per 1,000 tonnes, 2003-2012

	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

TABLE 2: Consumption of orange juice, highlighting the 10 top markets, in 1,000 tonnes, 2003-2012

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 Tetra Pak.

Source: Prepared based on data from Tetra Pak Compass

in emerging markets, which are still relatively small, and there has been a recovery in some of the traditional European markets. However, a solution could still be a long way off. 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 as a result of the low juice content in these beverages. Along with nectars and still drinks, there are the other fruit flavors and beverage categories, such as sport drinks, teas, coffee-based drinks, flavored milk, and flavored waters, which have experienced higher consumption growth rates.

In 2012, the CitrusBR ordered a survey to investigate the reasons behind the decline in orange juice in the global market. The study was conducted in 10 countries: Japan; the USA; the United Kingdom; France; Russia; Poland; Germany; China; Norway and Canada. As many as 106 experts were interviewed over six months.

One finding revealed that in countries where there was a growth in consumption, juice is positioned as a liquid health food that is 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 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 a scarcity of food, juice was considered at that time to be a full glass of energy and vitamins. But, awareness of this benefit was lost in subsequent generations. This is suggested as one of the reasons for the drop in consumption. Overall, the results of the survey showed the following (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 a serious one, 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 drinking the juice.
— A variety of innovative beverages have entered the marketplace.
— Market positioning has had an impact on the reasons for consumption.

Juice is positioned for its freshness and flavor and therefore competes 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, according to European bottlers interviewed for this study, increases the bargaining power and suppression of prices, and decreases alternative distribution channels for orange juice on the part of bottlers. Table 3 shows that the participation of five of the largest retailers in food sales, by country, has been growing year on year.

TABLE 3: The market share of the five largest retailers in food sales in selected countries, 2000-2010

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 neighbourhood retailers.
Source: Prepared based on data from Planet Retail and Abras

Another interesting aspect of retail is the introduction of a strategy for reducing retail costs and expenditures: The adoption of own brands – the so-called private labels, or white brands. This type of product is systematically gaining

ground in the market in relation to the traditional brands. In developed nations, they offer the same standard of quality at a lower price. Consequently, manufacturers of traditional brands are putting enormous pressure on all links in the chain to ensure the market competitiveness of their products.

According to estimates by the bottlers, when it comes to price levels in 2011, a retailer's net earnings are at least 0.10 euro for each 1-liter package of orange juice sold. The conversion rate of euros to dollars in 2011, made 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 was earned by retailers, while the remaining 30% of the profit margin remained for the bottlers, processors and growers.

It is therefore 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

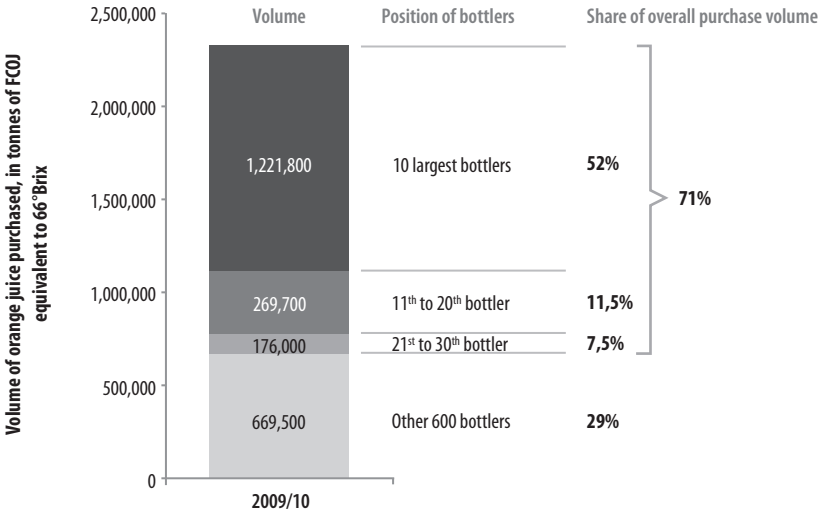
Bottling companies that purchase Brazilian orange juice (FCOJ or Not from Concentrated – NFC), for use in their drinks with different blends and brands, have a far-reaching impact. Since Brazil exports 95% of its production (comparing production data from CitrusBR and export data from the Brazilian Department of Foreign Trade at the Ministry of Foreign Development, Trade and Industry (SECEX/MIDC)), the country is highly dependent on these bottlers located abroad, as well as their successful bottling, distribution and marketing campaigns. Without bottlers, the orange juice produced in Brazil wouldn'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. Almost all of them throughout the world also bottle various other 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. 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 multiproduct companies, where orange juice is just one more item in 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. This provides more attention and priority to the categories of beverage production that offer the best profit margin at any given time.

FIGURE 1: 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 the Foreign Agricultural Service (FAS) of the United States Department of Agriculture (USDA), the global production of orange juice has decreased. It was below consumption in the 2008/09 season, data from Tetra Pak reveals. In the 15 seasons from 1995/96 to 2009/10, the drop in the 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 the 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 totalled 2.1 million tonnes of product and US$2.6 billion in revenue. This represented 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 orange processing to rise 224% over the period from 2003–2010. This was a jump from US$347.54 to US$534.28 per tonne of FCOJ.

TABLE 4: Exports from the Brazilian citrus complex, 2001–2012

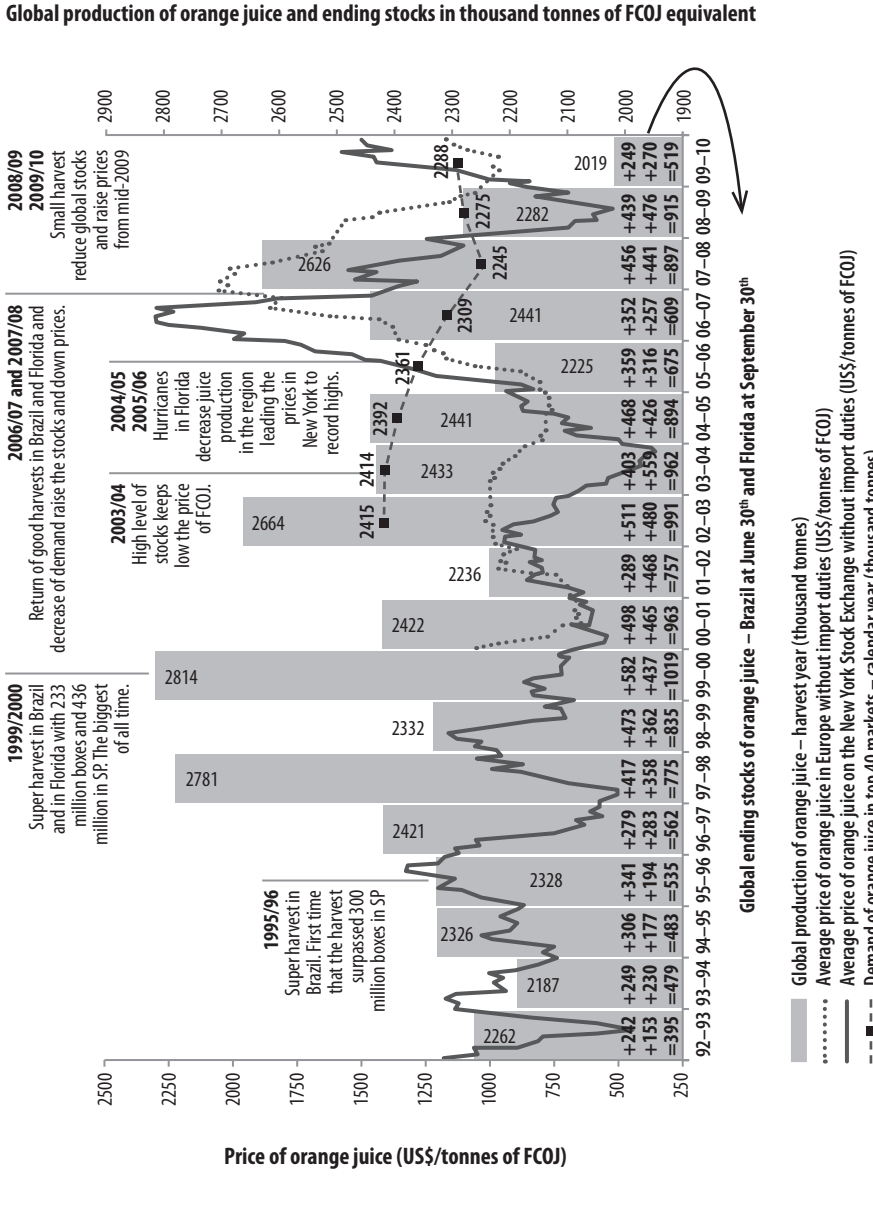
Year	Value (FOB)	Volume		
	Total exports from the citrus complex (US$ million total)	Processed products		Fresh oranges – volume exported (thousand 40.8kg box)
		FCOJ & NFC Conv. 66°Brix (thousand tonnes)	Other products & derivatives (thousand tonnes)	
2001	US$986	1,348	1,261	3,421
2003	US$1,375	1,362	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 its production and prices, in contrast to a virtually constant demand (Figure 2).

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%.

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



Source: Prepared based on data from CitrusBR, USDA, Foodnews, Tetra Pak

In summary, the fact that 80% of world production is concentrated in São Paulo and Florida are the indexes of productivity responsible for the great variability in the volume of orange juice being produced and offered to the market. In a short time period, these variations have caused the price of FCOJ to become highly volatile, causing great disturbances to the economic production chain. During this period, there was also a wide price fluctuation in the physical markets of Europe; ranging from an average of US$712 per tonne of FCOJ in January 2001 to US$2,230 per tonne of FCOJ in July 2007. There was an even greater amplitude in the New York Stock Exchange. 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 tonne of FCOJ equivalent, tax-free. In December 2006, it reached the roof, with average daily closures of US$2,123 per pound in solids – an equivalent to US$2,432 per tonne of FCOJ equivalent, tax-free.

The average prices without import duties shown in Figure 2 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 to historical sales (final prices) of FCOJ to bottlers. The prices were averaged without import duties and anti-dumping duties in the North American market. They were calculated based on the average daily closing price and monthly sales of FCOJ on the New York Stock Exchange.

According to the interviews, the dynamics of the sector are 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 year on year, relatively independent from the amount of orange juice offered on the global market, since the final prices on store shelves experiences 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 an oversupply of orange juice on the world market.

— Despite 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 six months to 24 months, instead of the futures market, which has low liquidity in periods longer than six 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. 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. These include 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, with the remaining 20% being bought by about 565 bottlers. Following the same trend, the Brazilian orange producers are seeking gains in efficiency as a result of greater scale, and have

been swiftly consolidating. Two percent of them already own 55% of the trees in the citrus belt.

Producers

Orange growing is present in all Brazilian states. According to Brazilian Institute of Geography and Statistics (IBGE), 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, accounting 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 to about 2010. This decrease has not been accompanied by a reduction in the number of boxes harvested. On the contrary, there was 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 the citrus industry in 2011 were the same as the industry that existed 20 years before that, it would have taken nearly 280,000 hectares more to reach the same 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 represents 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.

The analysis of operating production costs for the industry-owned orange groves for the 10-year period from 2000/01 to 2009/10 reveals 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 the 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 to integrate future actions, because of this sector's importance in generating jobs and income.

TABLE 5: The average operating cost of orange production of industry-owned orange groves (40.8kg 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-owned 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

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 (%)	Number 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	11,333	13.4	76.05	9,603
Total	**100.00%**	**100.00%**	**15,000**	**100.00%**	**100.00%**	**12,627**

Source: Prepared based on data from CitrusBR

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 hi-tech solutions, are generally an ideal size for a proper dimensioning of equipment, and have 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 was produced in this area. This is a major difference from the other properties that made up the other 56% of orange grove acreage, which on average produced 909 boxes per hectare (see Table 7).

TABLE 7: Stratification of orange production per range of yield in the 2009/10 growing season

Range of productivity (Boxes per hectare)	**% of area** (hectares)	**% of boxes**	**Volume of boxes produced per range of yield**	**Yield** (average boxes per hectare)
Over 1,400	2%	5%	16 million	1,655
From 1,000 to 1,399	7%	13%	41 million	1,209
From 800 to 1,099	19%	29%	92 million	933
From 500 to 799	28%	30%	95 million	639
From 200 to 499	36%	21%	67 million	345
Below 200	8%	2%	6 million	138
Total	**100%**	**100%**	**317.4 million**	**607**
Total over 500	56%	77%	244.4 million	909
Total below 499	44%	23%	73 million	280

Source: Prepared based on data from CitrusBR

This dynamic that is occurring 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 their properties – a new strategy to run their farms. This could consist of cost leadership, differentiation or diversification.

In addition to the cost of production, pests and diseases affect citrus production in Brazil, undoubtedly posing a major threat to the nation's citrus industry. Over the past 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% per 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 about 78 million boxes, compared to the 317 million boxes harvested in 2009/10. This represented roughly a 20% decrease in harvest.

1.5 Conclusions and managerial implications

This paper provides a detailed analysis of the complex nature of the orange juice chain and 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 has changed considerably. These 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 co-ordination of the chain as a whole, and the incessant quest for efficiency and low costs will boost the performance of all the links that make up the chain.

In all probability, 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 following series of steps, which have managerial implications, need to be taken:

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 exports, trade and investment in a promotion agency (APEX-Brazil).
3. Redeem consumers' traditional values and reposition orange juice as a liquid food.
4. Diversify distribution channels and efforts to develop the brand "Drink Brazil", creating intimacy with the final consumer.
5. Support strategies to create a consumer pull-effect by establishing one communication program that works on one brand positioning for juice orange produced in Brazil. Such a mark could be used internationally by bottlers to add value to the product.
6. Develop the domestic market.
7. Strengthen the representative associations to enrich the debate in favor of uniting the links in the productive chain.
8. Disseminate best practices for agricultural management, aimed at increasing the productivity and competitiveness of the chain.
9. Support citrus growers in technical and financial matters.

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. This will then add value in the collective national interest. This contribution is vital during this crucial time for the orange juice chain.

2

AN EXERCISE TO DEVELOP THE INTERNAL MARKET FOR ORANGE JUICE[2]

2.1 Introduction

Three of every five glasses of orange juice consumed around the globe are produced in Brazil. This is because most of the frozen concentrate and not-from-concentrate orange juice produced in the nation is destined for export. In terms of percentage, 97% of the total amount of orange juice produced in Brazil is exported, so the country keeps only 3% of the orange juice it produces. In other commodities – unlike the one addressed in this paper – Brazil has a well-developed domestic market, allowing it to distribute production internally in times of bumper harvests, or when there are difficulties with exports. These are a few examples of the domestic market's share in the overall Brazilian production of selected commodities: Pork (84%); beef (83%); poultry (75%); soybeans (57%); and sugar (30%).

The biggest problem arising is that in the two primary markets of Brazilian orange juice, consumption has been falling year after year. Europe, which absorbs roughly 70% of Brazil's export volume, reduced its consumption by 5% between 2003 and 2011. Consumption in the United States, which accounts for about 15% of Brazilian orange juice exports, fell 21% in the same period. This reduction has occurred due to the increasing availability of new low-calorie drinks, as well as juices, nectars and non-carbonated soft drinks made from other fruits.

2 Published in the *International Food and Agribusiness Management Review* (IFAMA) (2013).

Given this fact, the central question addressed in this paper must be: Which business model and go-to-market strategies could be used to increase the consumption of orange juice on the Brazilian domestic market?

This paper aims to present information clearly and objectively about the current situation of the Brazilian citrus-growing sector, and to analyze an alternative to the current crisis faced by this sector.

2.2 Theoretical framework

Marketing and strategy

Authors Barksdale and Darden (1971) and McNamara (1972) define the marketing concept as a business philosophy; an ideal or a political position. In addition to this, McCarthy and Perreault (1984) state that the business philosophy can be contrasted with its implementation, influencing the activities and behaviors of an organization in accordance with tradition. Kohli and Jaworski (1990) use the term "market orientation" to define the implementation of the marketing concept. Thus, a market-oriented organization is one whose actions are consistent with the marketing concept. Also, according to Kohli and Jaworski (1990), the market orientation tends to provide a unifying focus for the efforts and projects of individuals and departments within the organization, leading to better performance.

A business model is essential to every organization, but there are many definitions. Frezza (1998) defines a business model as a flow, represented by a diagram that connects all the elements of the value chain – producers, distributors and consumers – indicating the flow of goods and services in one direction, and the flow of financial resources in the other.

Brigham (1999) states that "business model" is just another term used to refer to a strategy of the company. Viscio and Pasternack (1999) meanwhile, relate it to the way the organization is structured internally.

Lechner and Hummel (2002) define a business model as the architecture of products, services and the flow of information. This includes the description of various elements and their respective roles; the description of

potential benefits; and the description of sources of funds. It is, therefore, a logical summary of the creation of value of an organization or a network of companies, which includes assumptions about its partners, customers and competitors (Klueber, 2000; Dai and Kauffman, 2002)

Wind (2008) states that in a world in which fundamental changes are occurring in the marketplace and in the media, it is necessary to take a fresh look at marketing. The author concludes that marketing needs to rethink the use of measures of customer satisfaction. It needs to combine with the mass markets in the segment; it needs to build brands based on solutions for customers; it needs to empower consumers with information and tools of choice; and to address the failure of most customer relationship management (CRM) actions.

Strategies, market segmentation and marketing compounds (the four P's)

For Wind (2009), marketing thinking is linked to a set of fundamental concepts, which include the marketing concept; marketing exchanges; the four Ps of marketing (product, price, place and promotion); the three Cs (customers, company and competitors); customer satisfaction; relationship marketing; permission marketing; and collaborative marketing. The author argues that each of these concepts is being challenged and changed by a world of empowered consumers; intense competition; globalization; advances in technology; and the interdependence of these forces. The author also asserts that the world is changing rapidly, and that for faster learning to take place, marketing must combine traditional planning and research with an adaptive process of experimentation.

Markets consist of buyers who differ in terms of desires, purchasing power, geographical location, attitudes, and buying behavior. For Hax and Majluf (1991), segmentation is the key to business analysis, strategic positioning, resource allocation, and portfolio management. Segmentation clarifies where the company will employ competitive actions and how it will compete, as it helps the company to see these groups of consumers (Kotler, 1996, David, 2001).

Kotler (1996) comments that the central point of modern strategic marketing consists of these activities: Market segmentation, differentiation, and positioning of the offer. The adoption of marketing to target markets requires these steps. The first is market segmentation. The second step consists of choosing the target market and selecting one or more market segments with which to work. The third step is market positioning: The act of establishing and communicating the key benefits of the product to the market. Andreasen and Kotler (1996) specify three elements that should be included in an essential marketing strategy:

1. One or more particular target markets.
2. A clear, well-defined competitive position.
3. A marketing mix, carefully developed and co-ordinated to meet the needs of the target market, while distinguishing itself from the offer of the competitors.

In the marketing mix, the product variable plays a key role, representing the set of attributes, functions and benefits that customers buy (Czinkota et al., 2001). Goods, services and ideas comprise a product, forming the offer of a company that meets a need (McCarthy & Perreault, 1997; Kotler, 2000).

According to Shimp (2002), all modern organizations, whether private or non-profit-making companies, use forms of marketing communication to promote their offers and achieve their financial and non-financial goals. Marketing communication consists of the efforts made by a company to transmit information to other members of the network, thereby seeking to influence attitudes and behaviors. Specifically speaking, communication involves telling the target public that the right product is available, at the right price and in the right place (Perreault and McCarthy, 1997).

According to Stern et al (1996), distribution channels are "a set of interdependent organizations involved in the process of making the company's product or service available for consumption or use". The emphasis is on how to plan, organize and manage alliances among institutions, agencies, and internal relations in companies (or hierarchical relationships). Through these definitions, there exists a strong connection, although little explored in traditional books, between distribution channels, contracts and transaction costs.

Although other variables in the marketing mix have become important in recent decades, price continues to be one of the key elements in determining companies' market share and profitability. Lovelock (1996) states that price is the only element of the marketing mix that produces revenue. The other variables, although essential for the success of the company, produce mainly costs and are, therefore, considered more difficult to understand. Price is also one of the most flexible variables (Palmer, 2000), as it can be changed quickly, unlike other components. For instance, consider changing a product or a loyalty to a distribution channel. The flexibility in the prices charged by competitors is one of the largest problems faced by companies.

Collective actions in agribusiness

As described by Saes (2000: 177), in the area of private interest, there are three types of actions that could characterize collective strategies for different organizations. These are:

1. Type I actions, which benefit all of the participants. These are actions that bring together players from different segments around the proposed action. There are no conflicts to be managed or resolved. An example would be providing statistics for the members of an organization.
2. Type II actions, which benefit part of the group without compromising the others. These are based on the stakeholders in the provision of a particular good or service, and there should no objections from the other participants who are not the focus of the action. For example,, creating partnerships with other segments to purchase raw materials or obtain financing, in which only some of the members of an organization participate.
3. Type III actions, which benefit part of the group to the detriment of the others. In these instances, conflicts arise that must be managed with the development of compensation mechanisms between players.

With regard to collective actions, Lazzarini et al. (2001), considers that a vertical link affects the performance of a chain if horizontal collective actions are performed within this link. Farina (2002) also states that collective or co-operative actions may be strategies that meet retail requirements.

Neves (2005) points out some opportunities for the use of collective actions among companies, which should be included in the strategic planning and management of marketing. These include joint advertising; collective advertising for market growth as a whole; the promotion of combined sales; public relations; the development of a lobby; joint participation in fairs and events; and a shared sales force.

Neves and Oliveira (2007) studied some collective communication actions within international organizations, in an effort to determine which forms of action encourage the consumption of their products, thus impacting on the supply chain. Two production chains in four organizations were studied: Milk and coffee. The organizations studied were: Fedeleche (Chile), Dairy Australia (Australia), the National Federation of Coffee Growers of Colombia (Colombia) and MilkPEP (United States). Below is the summary table of some points of the campaigns of these organizations.

Emerging and developing markets

Authors like Mahajan and Banga (2006) and Prahalad (2005) also affirm the need to rethink marketing strategies to develop new products, services and business models for a developing world, and so take advantage of the opportunities presented by emerging economies.

Emerging markets, like Brazil, have some unique characteristics that differ from developed markets. Sheth (2011) indicates that these emerging markets have five key features: A heterogeneous market; socio-political governance; a chronic lack of resources; competition without brands; and inadequate infrastructure. These features are radically different from those of traditional, industrialized, capitalist societies. This prompts us to rethink the basic premises of marketing, such as market orientation, market segmentation and differential advantage.

The author states that in order to accommodate these characteristics, we must rethink the marketing perspective. For example, the competitive advantage for market grouping and standardization; and the center of orientation on concepts of strategy, such as the market orientation towards market development. Likewise, we should also rethink public policy issues and marketing practices.

TABLE 8: A summary of marketing campaigns of international organizations

	Public	Objectives	Message	Concept	Actions
Fedeleche	Young people aged 15–30 years	Turn milk into a younger and more interesting drink.	Drinking milk is cool.	Drink milk	Tents in summer associated with extreme sports
Dairy Australia	Children	Make milk a daily habit that is healthy and fun.	Milk is part of the fun.	Three daily servings	Recipes; games; fun books
Dairy Australia	Adults (mothers)	Show mothers that milk is essential for their children.	Milk has the necessary nutrients for children's healthy development.	Three daily servings	Informative books and magazines
Dairy Australia	Adults	Show the importance of milk for adults and the elderly.	Milk has the nutrients adults and the elderly need too, and helps combat certain diseases in adults.	Three daily servings	Informative magazines; working with opinion-formers
Dairy Australia	Doctors/ Nutritionists	Encouraging opinion-formers to convey the message that milk is nutritious.	Milk has unique and specific properties that should be recommended.	Three daily servings	Events related to osteoporosis
FNC	Coffee consumers who are not loyal to Colombian coffee	Turning Colombian coffee into a synonym for quality.	Colombian coffee is of superior quality.	Café da Colômbia	The character Juan Valdez; coffee tents; identification of Colombian coffee with a 'seal'.
MilkPep	Milk consumers who could consume more	Encouraging consumers to buy milk in store.	You should always have milk so that you don't run out when you most need it.	Got milk?	Using famous personalities; promotions through the website

Source: Neves e Oliveira, 2007

Sheth (2011) further states that the real challenge and opportunity in emerging markets is to convert the non-user into a user. To do this, it is necessary to develop a marketing strategy geared towards the economic, social and emotional value of outsourcing. This achievement is similar to winning over users to new technologies, such as computers or cellphones. As Sheth and Mittal (1996) state that what matters most when creating new users is their demand when it comes to standardizing expectations, through design, development and incentives.

2.3 Method

The following objective of this paper is to present clear and objective information about the current situation of the Brazilian citrus industry. The desire is also to examine an alternative: To develop the Brazilian domestic market through the creation of a specific product for this market by seeking to resolve the current crisis in the international consumption of orange juice. This work consists of three steps.

In the first step, we must understand the theory of the go-to-market strategy. We sought to understand the marketing strategy theories of Porter and Kotler in order to understand the changes in the concepts of marketing and strategy; to find out the marketing strategies and concepts of market segmentation; to address the theory of the four Ps of marketing (product, price, place and promotion); to analyze collective actions in agribusiness; and to understand the behavior of emerging markets and developing countries.

The second step is to conduct a series of in-depth interviews in order to draft proposed guidelines for the sector. Among the interviews and workshops held, the following are most worthy of mention: Four workshops with growers; one workshop with the Ministry of Agriculture; one workshop with the Ministry of Finance; one workshop with the Administrative Council for Economic Defense (CADE); interviews with orange juice and ready-to-drink beverage factories; and interviews with self-service retailers and other agents in the orange juice productive chain.

The third step involved compiling the results obtained in the interviews and workshop, in order to systematize the information and draw up a business plan for the new product to be created.

2.4 Results and discussions

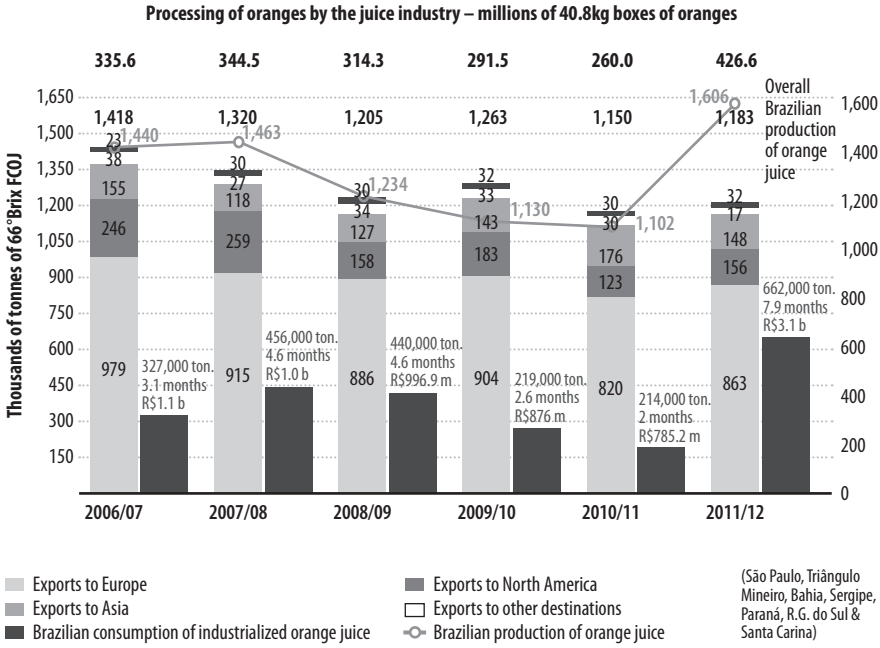
The substantial drop in the Brazilian export of orange juice in six growing seasons (Figure 3), with a 16.5% decrease (from 1,418,198 tonnes of 66°Brix FCOJ in 2006/2007 to 1,183,496 tonnes in 2011/2012) negatively impacted the flow of the Brazilian citrus chain by 235,000 tonnes of 66°Brix FCOJ and limited the processing of oranges by the industries. The record production of orange juice in Brazil (1,606,207 tonnes of 66°Brix FCOJ in the 2011/12 crop year) generated an increase in juice production of roughly 45.8% compared to 1,101,928 tonnes 66°Brix FCOJ produced in the previous crop year.

The combination of the record production of orange juice in the last crop year and the decline of worldwide consumption by 6.7% in eight years (from 2,432,000 tonnes of 66°Brix FCOJ in 2003 to 2,269,000 tonnes in 2011) made global stocks of Brazilian orange juice – which on June 30, 2011 totalled 214,369 tonnes, or the equivalent of two months of turnover – grow to 662,452 tonnes, or the equivalent of 7.9 months of turnover.

In 2011, in Brazil, out of a total of 2.9 billion liters of beverages substituting "100% orange juice," only 47 million liters were "100% juice". Out of those, only 15 million liters were orange-flavored "100% juice". This shows the lack of interest of the bottling companies in developing the consumption of "100% orange juice" on the Brazilian domestic market. The market of "non-carbonated soft drinks with juice concentration below 25%" and "nectars with juice concentration of 25–60%" offer far more attractive profit margins to bottlers.

This lack of interest in developing the 100% juice market on the part of the bottling companies operating on the Brazilian market lost the citrus sector the opportunity to distribute 246,000 tonnes of FCOJ 66°Brix. This means that, for the domestic market, about 65 million 40.8kg boxes of oranges from the citrus belt of São Paulo and Triângulo Mineiro went unprocessed – if

FIGURE 3: The situation of supply, demand and carry-over stock of Brazilian orange juice, 2006/7–2011/12



Source: CitrusBR, SECEX and Tetra Pak

demand is recalculated based on the European Pattern Mix of consumption. This situation can be clearly seen when we compare the average retail selling prices in 2011. While 100% orange juice is sold in Germany for US$1.16/liter, and in France for US$1.05/liter, in Brazil, nectar – which contains less than half of the raw material used in 100% juice – is sold at US$1.59/liter. For the sake of comparison, nectars are sold at US$0.66/liter in Germany and US$0.81/liter in France.

Given the problems presented, the solution was to create a 100% orange juice brand that seeks to stimulate the demand for this kind of juice on the Brazilian domestic market, thereby absorbing excess juice production in years of high production.

The structure and creation of this juice brand is described below, using the concepts of go-to-market strategies.

Organizational structure

The structure is simple and can be created and managed in just a few days. It is defined as a consortium, the "Consortium-Consecitrus". This is a company within Consecitrus consisting of three parties: Producers' representatives, orange juice-processing industries, and the government. The company created would be responsible for buying orange juice from the producer plants, through the creation of a partnership to use the existing packaging structure (utilizing idle packaging capacity of around 303 million liters per year) via a partnership agreement (full service, including packaging and distribution to retailers' distribution centers) with co-packers. This would create a brand for the distribution of 100% orange juice, with marketing investments of R$20 million/year for the sales and marketing structure. It would also define the purchase price of juice, which would be determined by Consecitrus, deducting the costs of international logistics. Because it is a consortium not aimed at profit, with a main goal of stimulating domestic demand to absorb the excess orange juice produced in Brazil, all of the results of this company are put back into national and international communication in favor of 100% orange juice (Table 9).

It is estimated that the created company would represent a 1% share of the total beverages market in 2013, reaching 8% in 2020, with distribution focused mainly on the big retail chains and distributors. It is believed that with the introduction of this new product to the market, the absorption of orange juice on the domestic market will increase from 5.2 million boxes (40.8kg) in 2013 to 48.7 million boxes in 2020. This is an increase of approximately 8.5 times in seven years, resulting in 184,000 tonnes of FCOJ equivalent (66ºBrix). Totalling this absorption by the domestic market, with exports to emerging and developing countries, it is the equivalent to the loss of market share of the leading importers.

Positioning strategies

Seeking to stimulate the latent domestic demand for 100% orange juice, it was decided that the orange juice brand Consecitrus would carry the message that the product is rich in vitamins and excellent for nutrition; that it is a fresh,

TABLE 9: Estimates of demand, investments and mark-up of the 100% orange juice brand Consecitrus

Indicators	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Exchange rate	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
Estimated market (million liters)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Total market	10,447	10,635	10,871	11,122	11,390	11,675	11,979	12,304
Orange juice 100%	104,47	212,70	326,12	444,88	569,49	700,51	838,55	984,31
Annual growth		104%	53%	36%	28%	23%	20%	17%
Participation	1%	2%	3%	4%	5%	6%	7%	8%
Mix of distribution	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Food service	0%	0%	0%	0%	0%	0%	0%	0%
Large retailer	62%	61%	59%	58%	56%	55%	53%	50%
Distributors	30%	31%	33%	34%	36%	37%	38%	40%
Wholesale	8%	8%	8%	8%	8%	8%	9%	10%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Marketing (R$milhões)	**20,0**	**25,0**	**25,0**	**25,0**	**25,0**	**25,0**	**25,0**	**25,0**
Overhead (R$milhões)	**2,6**	**3,2**	**3,2**	**3,2**	**5,0**	**5,0**	**5,0**	**6,0**
Contractual fund	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Food service	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%
Large retailer	15,0%	15,0%	15,0%	15,0%	15,0%	15,0%	15,0%	15,0%
Distributors	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Wholesale	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%	5,0%
Average value	9,7%	9,5%	9,3%	9,0%	8,8%	8,6%	8,4%	8,0%
Mark-up retail	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Food service	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Large retailer	30,0%	30,0%	30,0%	30,0%	30,0%	30,0%	30,0%	30,0%
Distributors	25,0%	25,0%	25,0%	25,0%	25,0%	25,0%	25,0%	25,0%
Wholesale	20,0%	20,0%	20,0%	20,0%	20,0%	20,0%	20,0%	20,0%
Average value	27,7%	27,6%	27,6%	27,5%	27,4%	27,2%	27,2%	27,0%
Absorbed by market demand	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Total volume of juice 100% (million l) – 11.8°Brix	104.47	212,70	326,12	444,88	569,49	700,51	838,55	984,31
Volume equiv. FCOJ – 66°Brix (thousand tonnes)	20	40	61	83	106	131	157	184
Demand for fruit (millions of boxes of 40.8kg)	5,2	10,5	16,1	22,0	28,2	34,7	41,5	48,7

Source: Prepared by the authors

liquid food; a product suitable for export; that it creates jobs and brings tax revenue for the country; that it is made by local Brazilians, that it is delicious, and that it is the same all year round. Based on the generic strategies of Porter (1989), the aim is to position the product with differentiated quality, but as a leader in cost.

Product

The product to be delivered by the company Consecitrus will be 100% orange juice, not from concentrate (NFC) or reconstituted (FCOJ), with higher quality than the nectars available on the market and at a more competitive price. The juice will be packaged in 1-liter, 330 ml and 200 ml Tetra Paks, similar to various other ready-to-drink beverages sold on the market. The brand to be created, Consortium-Consecitrus, will have a marketing investment of R$20 million for five years, increasing to 25 million after that.

Price

The pricing strategy used would be the total production cost of the product plus the retail mark-up. The product packaging will show the recommended retail price. The estimated price of 100% FCOJ, at a price of U$2,100/tonne, is R$4.38/liter. Costs alone, with taxes, represent 27% of the final price – approximately R$0.69/liter. Add to this the retail mark-up, which is 45% of the production cost, and that gives a total of R$1.51/liter (Table 10).

Market

In the distribution and sales channels, priority will be given to the distribution of high volumes. This will ensure above-average profit margins for the big retail chains. The initial intention is to form a partnership with three major operators in Brazil: Pão de Açúcar, Carrefour and Walmart. After consolidating the partnership with these major groups, we should then begin to allocate volumes to wholesalers and distributors, who will distribute to the medium and small retailers. The sales team should be structured to include an account

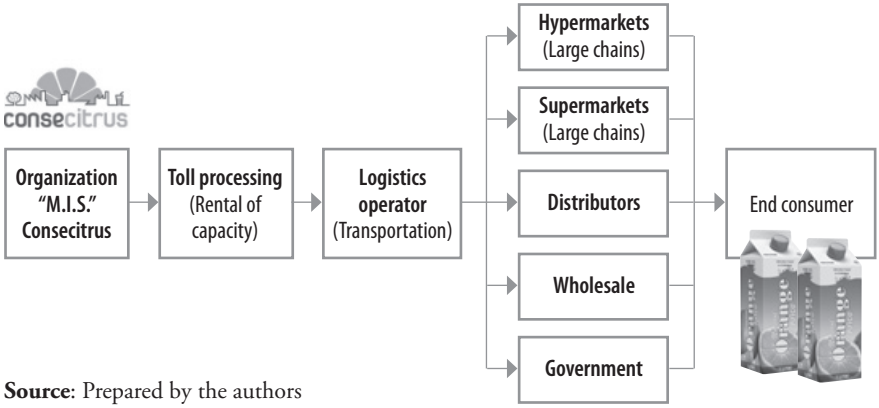
manager for each big retailer, plus one or two account managers responsible for the distributors and wholesalers. The government would become a source of distribution in years of super-abundance, as a buyer of concentrated juice to distribute in the public schools.

TABLE 10: Breakdown of items related to price

Breakdown of the recommended price of 100% reconstituted orange juice	Unit cost – 1 liter
	R$per liter – orange juice reconstituted to 11.8°Brix
Final price of frozen concentrated orange juice delivered to the packaging plant FCOJ 66°Brix – including INSS (Social Security contributions) agribusiness	R$0.7588
Final price of frozen pulp – U$800/tonne – 11.8°Brix – 6% dosage – including INSS (social security contributions) of agribusiness	R$0.0951
Aroma – U$151/pound to 2 pounds per 20,000 liters	R$0.0320
Loss of 1.5% of orange juice during the packaging process and industrial CIP	R$0.0114
Cost of packaging the juice – co-packing –full service	R$0.2900
Cost of packaging materials: Tetra Pak cartons, tray, shrink wrap, and cardboard boxes	R$0.4072
Total operating cost of packaged orange juice delivered to the CD of the retailer	**R$1.7968**
Overhead	R$0.0250
Investments on promotional marketing of orange juice	R$0.1914
Final cost of packaged orange juice delivered to the CD of the retailer	**R$2.0132**
Agreed funds "big chains" – 15%	R$0.5060
Recommended retail price of packaged orange juice, free of taxes – "big chains"	R$2.5192
ICMS on retail sales	R$0.3023
Tax substitution cost	R$0.1300
PIS/ COFINS on final operation	R$0.2610
Mark-up of the business – break-even point – 5%	R$0.1606
Recommended retail price of packaged orange juice with taxes – "big chains"	**R$3.3731**
Mark-up "big chains" – 30%	R$1.0119
Recommended retail price of packaged orange juice on the shelf "Big Chains"	**R$4.3850**

Source: Prepared by the authors based on CitrusBR data

FIGURE 4: Network of sales and distribution channels



Source: Prepared by the authors

Promotion

The promotion of 100% orange juice of the "Consortium Consecitrus" brand – specifically communication – will be geared towards different target publics, and the most effective communication tools for each specific target public will be chosen. The total budget for communication and marketing would be R$20 million in 2013 and R$25 million annually from 2014 to 2020 (Table 11).

2.5 Conclusions

The solution to the current crisis in the Brazilian citrus sector depends on aggressive public-private policies to encourage consumption of fresh oranges and industrialized orange juice on the Brazilian domestic market, as international consumer markets are near saturation. Orange growers and orange juice producers should spearhead this initiative, since traditional bottlers show no interest in developing this market.

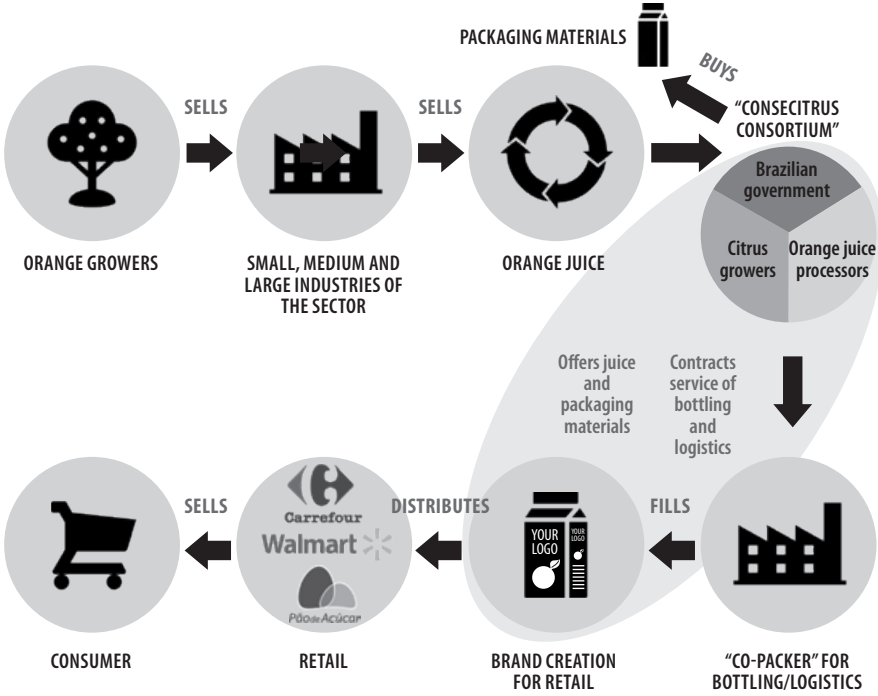
The business model proposed for development of the domestic market, and the go-to-market strategy, is depicted in Figure 5 and summarized in the following items.

TABLE 11: Communication plan for 100% orange juice

Target publics	Objectives	Communication mix	Budget	Measuring	Management
End consumer – Parents – Children and teenagers – Singles – The elderly – Athletes – Classes: A, B, C **Opinion leaders** – Health: doctors and nutritionists – Government – Union – NGOs – Production chain – Retail self-service – Producers – Facilitators – Associations	– Try the product and understand the difference (compared to other beverages) – Try it – Expansion of existing demand – Inform the wider concept (Positioning, suggested price and value captured by the consumer.) – Recommendation and endorsement by healthcare professionals	**Message: placement** Advertising – TV concept (Emerson Fittipaldi and/or other 'voluntary' athletes) – Digital media (gaming sites, Consecitrus with new concept) – Interviews – Contest – AM and FM radios: functional and economic arguments **Sales promotion and point-of-sale promotion** – Text explaining the concept – Tasting and sampling – TAM flights (indoctrinate): blue + folder concept – Sporting events – Push marketing at points-of-sale **Public relations and advertising (press office)** – Lectures on the concept (the whole target public: journalists, congresses for doctors and nutritionists) – News in newspapers and magazines – Government announcements – TV explaining the concept: Globonews, Globe reporter, Youtube and digital media. – Magazines: Press releases – Nutrition and doctors with position paper based on review of studies from Florida	R$20 million in 2013 (R$0.19 per liter) R$25 million/year, from 2014 to 2020	– Recall research – Access site – Buzz marketing – Degree of knowledge – Acceptance of the idea – Sales	Arrange the steps in order. Thinking of and strengthening the document.

Source: Prepared by the authors

FIGURE 5: The business model for the development of the domestic market



Source: Developed by the authors

In summary, this model involves:

1. The creation of a tripartite trading company, whose members will be orange growers, orange juice factories and the government.
2. The construction of the institutional arrangement, detailing the scope and governance of this new enterprise.
3. The creation of a brand for the distribution of 100% orange juice, with marketing investments in the order of US$12 million per year.
4. Positioning orange juice on the domestic market to highlight the following characteristics: High nutrition and vitamin content; liquid food; freshness; an export-quality product; job creation; tax generation; "made by us"; delicious; and consistent throughout the year.

5. Use of the extant bottling structure of several ready-to-drink beverage factories (idle at around 303 million liters/year) through partnership agreements (full service, including bottling and distribution to the retailers' distribution centers), with co-packers.
6. Prioritization of the distribution of large volumes, assuring above-average profit margins for major retail chains (The 'big three': Pão de Açúcar/ Casino; Carrefour, and Walmart. This accounts for roughly 45%, including margin and slotting fees.
7. The allocation of volumes to wholesalers and distributors, which distribute the products to medium and small retailers.
8. Introducing a structured sales team, with an account manager for each major retailer, and one or two more to attend to distributors and wholesalers.
9. The creation of an efficient and sector-specific sales and marketing structure.
10. The reversion of all profits from this company to national and international communication campaigns in favor of the consumption of 100% orange juice.

From all of the information gathered, it becomes evident that there is a viable alternative and option for the Brazilian citrus chain to reduce the effects of the consumption crisis in the main consumer markets. This benefits the national collective interest in all aspects. With all strategies operationalized, we estimate a potential market of 984 million liters of 100% orange juice in 2020, which would require 50 million boxes of oranges. This initiative would help ensure that this production chain remains competitive, providing better quality of life for society and further development for Brazil.

3

MAPPING AND QUANTIFICATION OF THE BRAZILIAN CITRUS CHAIN

3.1 Introduction and research problems

Right since the colonization of Brazil,, orange trees have been cultivated and spread throughout the national territory, where they have thrived in excellent edaphoclimatic conditions. The combination of an established competitive citrus industry and developed crop production made it possible for Brazil to become the world's largest producer of orange fruits.

Citriculture is currently present in more than 3,000 Brazilian municipalities. Almost 400 of these are located in the state of São Paulo, and generate more than 200,000 direct and indirect jobs.

According to FAO (2010), in Brazil in 2008/09, of the total planted area of citrus, 89.4% is planted with orange, 5.8% with tangerine, 4.7% with lemon and lime, and 0.1% with other citrus. Due to its predominance, a greater focus is placed on orange. More than 100 million boxes of orange of 40.8kg each is produced. About 30% of the national production is consumed each year as fresh fruit among Brazil's population, which has at its disposal a nutritious and healthy fruit at an accessible price.

The other 70% of the national production is processed into orange juice; of which 98% is exported, bringing US$1.5 billion to US$2.5 billion revenue to the country each year.

Mapping and quantification of agribusiness chains in Brazil have been the subject of several studies. The first, by Rossi & Neves (2004), focused on the wheat ; followed by orange juice by Neves & Lopes (2005); then milk by Consoli & Neves (2006); sugarcane by Neves, Trombin & Consoli (2010);

and again, the citrus chain by Neves & Trombin (2010). These findings are presented in this paper. In 2011, the cotton sector was studied, and then, finally, the beef industry.These studies aim to generate detailed knowledge about the magnitude of economic and social development of the production chain in the country. The analyses range from orchard inputs to the products offered to consumers. However, this study addressed the following questions:

- How significant is the sum of sales of the various links in the supply chain to the GDP?
- How much tax revenue is generated by the production chain?
- How many direct and indirect jobs are generated in Brazil?
- How significant is the sum of wages paid to workers during a season?

A complete overview of a chain of production is justified, since it provides greater transparency to the sector, clarifies and questions fallacies, and adds value to the image of the chain. The collected information allows for the collection of market intelligence that can support the structuring of a strategic plan in order to identify innovations in business, and to explore new opportunities and raise the competitiveness of the sector. The information may also be used to support decision-making in both the public sector and in companies operating both individually and collectively. The objective of this study is to provide further insight into the extensive dimensions and economic movements of the Brazilian citrus chain.

3.2 Theoretical background

Two traditional approaches to studying chains can be found. The commodity system approach (CSA) was developed by Goldberg (1968) in studies of citrus, wheat, and soybean production systems in the USA The CSA methodology emphasizes the sequence of product transformations in the system. The merit of Goldberg's method is that it changed the focus of analysis from the orchard to the entire system, thus preventing researchers from considering the agricultural sector in isolation from the overall economy.

The second approach, proposed by Morvan (1985), considers a chain ("filière") as linked operations in the transformation of a good. The chains

are influenced by technology and have complementary interdependences, according to Batalha (2001). According to Morvan (1985), the filière analysis is an important tool for describing systems; for defining the role of technology in the framing of production systems; for organizing integration studies; and for the analysis of industrial policies, firms, and collective strategies.

The supply chain is viewed as a system that integrates raw material suppliers, factories, distribution services, and consumers (Stevens apud Omta et al., 2001). Furthermore, there is the network concept in which organizations are directly involved in different processes that add value to the development of goods and services until they reach the consumer (Christopher apud Omta et al., 2001).

Lazzarini et al. (2001) integrated chain and network concepts in a study on net chains. According to these authors, the integration of these approaches allows for the consideration of existing organizational interdependences in a network, as well as the different mechanisms of co-ordination (managerial plans, process standardization and adjustments), and sources of value (production and operations optimization, transaction cost reduction, diversity, and "co-specialization" of knowledge).

Hardman et al. (2002) demonstrated the possibility of increasing the competitiveness of South African apple chain exports through co-operation among producers, packers, and exporters. From the ideas of CSA and the filière, it is possible to develop tools and managerial activities to improve the chains' efficiency. Thus, the concepts of Supply Chain Management (SCM) and the set of networks and net chain ideas are important theoretical concepts and empirical notions for the development of food and bioenergy chains (Batalha and Silva, 2001).

3.3 Objectives and methodological procedures

According to Malhotra (2001), to characterize and analyze a production chain, it is necessary to define its objectives as well as its boundaries and scope, participant subsystems of the production chain, and its environment. Batalha (2001) reports that for a chain analysis, the researcher must define certain

conditions that are consequences of the objectives to be reached. The most important and difficult definitions are related to the analysis scope and levels that should be detailed. Zylbersztajn and Neves (2000) also comment that the definition of the agribusiness systems boundaries shall be dependent upon the research purposes, which are generally focused on one product.

This paper aims to present a method for the mapping and quantification of production chains, and to discuss the results of this method in the citrus chain in Brazil, detailing in São Paulo state. The focus will be on citrus juices and derived products, as well as citrus fruits for fresh consumption. An overview of the citriculture will be provided in order to promote a better understanding of the business and the variables that impact its trends, while bringing more transparency to the sector. However, in some cases, data presented surpasses this scope, in order to analyze the dependence and importance of some agents and sectors in the production chain.

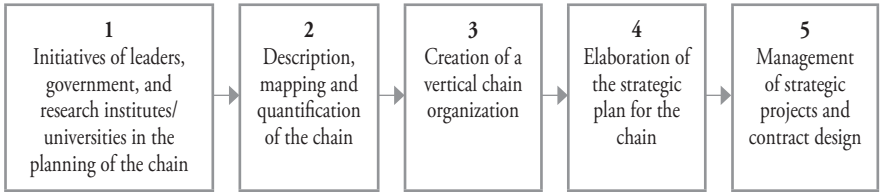
To achieve this, the Chain Plan method, developed by Neves (2007) was applied. This focuses on the strategic planning and management of agribusiness systems. As summarized in Figure 6, the method consists of a five-step process towards implementing strategic management in a production chain.

The second step consists of the mapping and quantification of chains. This step comprises six stages, as shown in Figure 7. Its application is relatively simple, and the collection of information does not depend on public sources of data – another advantage of this method. In addition, the figure obtained allows easy visualization of positioning and the relevance of different sectors in an existing value chain.

This will be explained in further detail in the method ChainPlan. The rest of the six steps elaborate on a preliminary design of the chain based on theory and the researchers' experience. It is also necessary to scope which segments will be studied, keeping the focus on the central axis of the system, due to the objective of the research. In this paper, it was opted for oranges, lemons/limes and tangerines as the raw material and central object of the system. This considers the Goldberg (1968) notion of the commodity system approach (CSA), and emphasizes a product as the starting point for the system analysis.

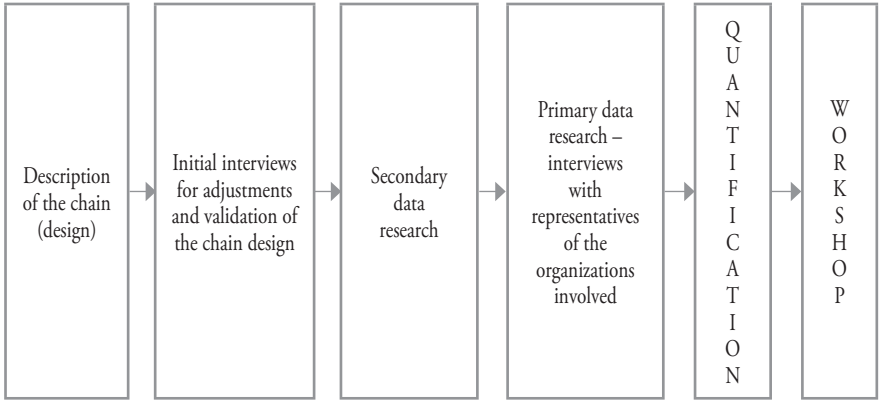
After the production chain is designed, the second step is to submit it to sector specialists and to interview them. They then propose possible adjustments in order to ascertain the current condition of the system.

FIGURE 6: The ChainPlan method for strategic planning management of food and bio-energy chains



Source: Neves (2007).

FIGURE 7: Method for mapping and quantification of the chain



Source: Neves (2007).

The third stage consists of the secondary data research which, according to Malhotra (2001), is collected for ends that differ from the problem of the research. For this step, data was mined from sources that have academic and statistical credibility, reputation, and integrity.

After the collection of the available secondary data, we started the collection of primary data (fourth step). This involved data originated by the researcher for the specific purpose of solving the problem in question (Mattar, 1993; Malhotra, 2001). Extensive interviews were conducted with representatives of several organizations in the citrus chain.

To select and define the interviews, we first identified which data was not found in the secondary research. Therefore, agents in the chain were selected for interviews. To be selected, the agent had to have certain characteristics: They had to have access to the information and data of the sector in the study; they needed knowledge and experience of the system; and they had to be willing to collaborate with the researchers and promote communication for future contacts. In addition, they had to be able to indicate possible contact agents who could contribute unavailable data.

The quantification (fifth stage) determined the turnover of each sector in the chain, through the company revenues and estimates of several subsectors of the citrus production chain. Therefore, it is important to delineate the period of the research evaluation. In order to ensure confidence in the data, some secondary and primary data was contrasted in an attempt to find incongruous elements. In this process, at least two different data sources were used to check the results, along with additional interviews with similar agents, when needed.

In the sixth step, a workshop was organized for the presentation of results and the discussion of numbers.

3.4 Results

This study estimated the Gross Domestic Product (GDP) value of the Brazilian citrus production chain at US$6.5 billion (Table 12) for 2008/09. This corresponded to approximately 2% of the country's agribusiness GDP. Of this total, US$4.39 billion was generated in the internal market, and US$2.15 billion in the external market. Sales of fresh fruit in the internal market represented 34%, and 28% from orange juice exports (FCOJ and NFC). It is important to note that orange juice exports accounted for 94% of the citrus complex exports. The citriculture GDP was estimated by the sum of the sales of final goods within the citrus agroindustry system.

Figure 8 represents the citrus chain, and the value in each column indicates the gross sale of that particular item in 2008/09. The gross revenue of the citrus sector in this period was approximately US$14.6 billion. This value represents the sum of the estimated sales from several segments of the production chain, as well as the financial transactions of the facilitating agents.

Pre-orchard

The agricultural input industry sold US$819 million in agricultural products to the citrus sector in 2008/09. The sales are detailed in Figure 8. It is important to note that 84% of the total value comes from sales of acaricides, fungicides and pesticides, owing to high standards required for pest and disease control.

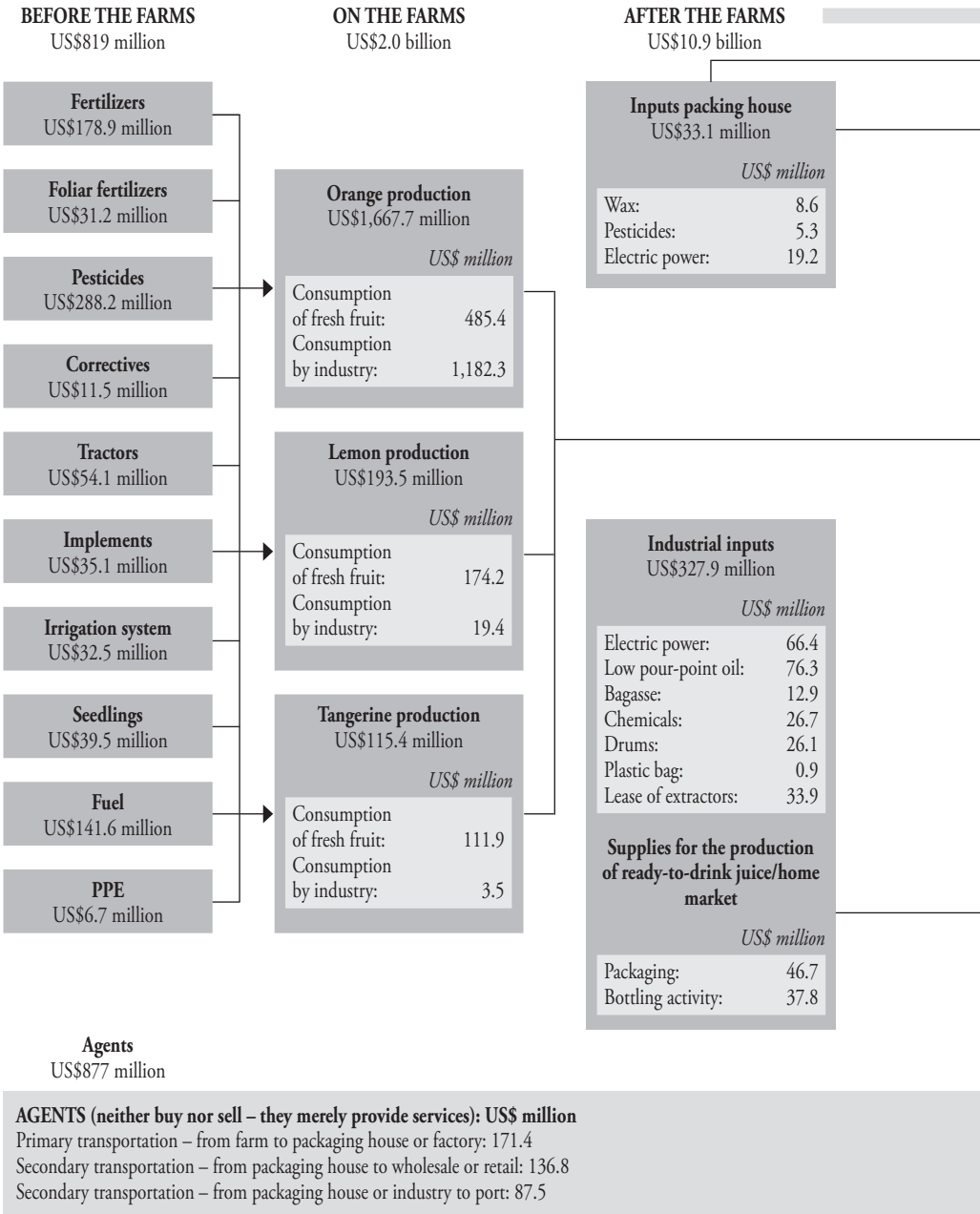
Citriculture is the second most intensive user of agricultural pesticides in Brazil, behind only cotton. In 2009, citrus producers consumed 4.2% of all commercial sales of agricultural pesticides (acaricide, insecticides and fungicides) and applied an average of 17.5kg/hectare in active ingredients, of which 6.8kg/hectare are acaricides and 5.1kg/hectare of insecticides. The increasing incidence of huanglongbing (HLB) and citrus variegated chlorosis (CVC) has drastically increased the consumption of pesticides in citrus crops by more than 600% from 2003 to 2009, directly impacting the total consumption of agricultural pesticides in citriculture (Figure 8).

TABLE 12: Gross Domestic Product (GDP) estimated for Brazilian citrus production chain based on final goods

Product	Internal Market (IM) US$ (millions)	External Market (EM) US$ (millions)	Total (IM + EM) US$ (millions)
Oranges	2,232.9	19.1	2,252.0
Lemons/limes	673.1	48.2	721.2
Tangerines	945.9	5.8	951.7
FCOJ	–	1,545.9	1,545.9
NFC	–	299.5	299.5
Citrus pulp	85.2	93.5	178.8
Essential oils	–	72.9	72.9
Terpenes	–	55.2	55.2
Frozen cells	–	9.1	9.1
D-Limonene	–	0.9	0.9
Orange juice/nectar	459.1	–	459.1
Total	**4,396.21**	**2,150.10**	**6,546.31**

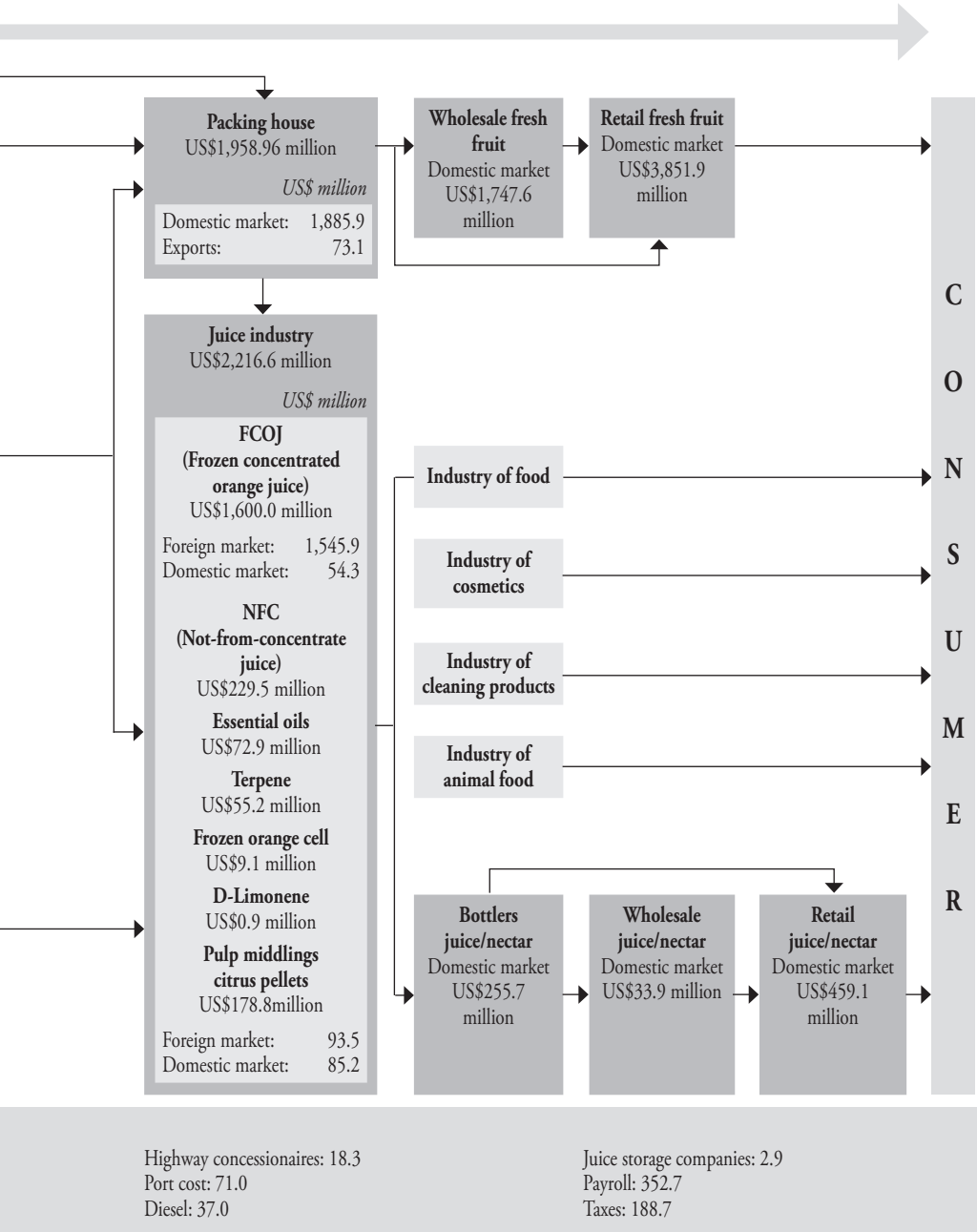
Source: Elaborated by author

FIGURE 8: The mapping and quantification of the Brazilian citrus chain in 2008/2009



AGENTS (neither buy nor sell – they merely provide services): US$ million
Primary transportation – from farm to packaging house or factory: 171.4
Secondary transportation – from packaging house to wholesale or retail: 136.8
Secondary transportation – from packaging house or industry to port: 87.5

Citrus production chain in Brazil – GDP: US$6.5 billion – Gross revenue: US$14.6 billion



Source: Elaborated by Neves and Trombin with data from Marketstrat

FIGURE 9: Sales of agricultural supply links in citrus cultivation in Brazil, 2008/2009

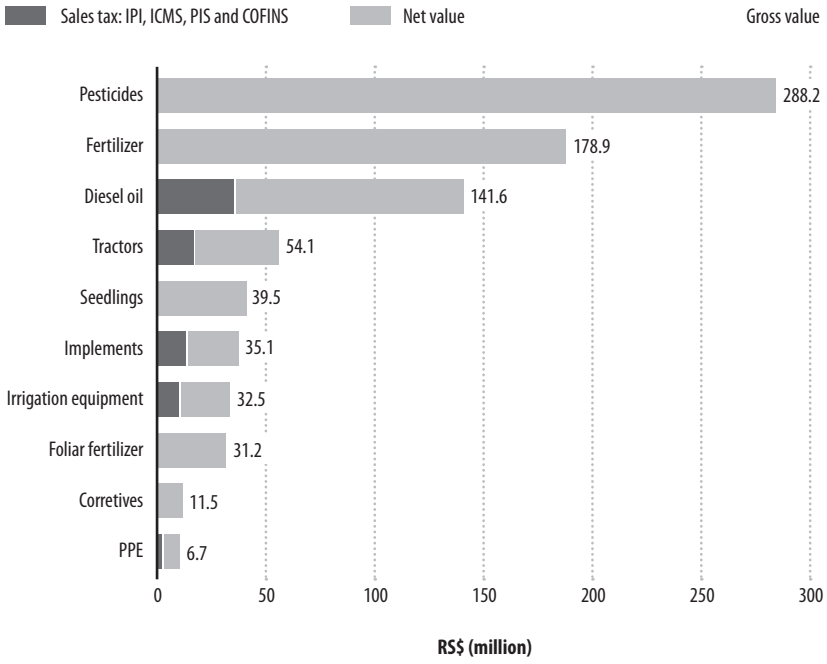
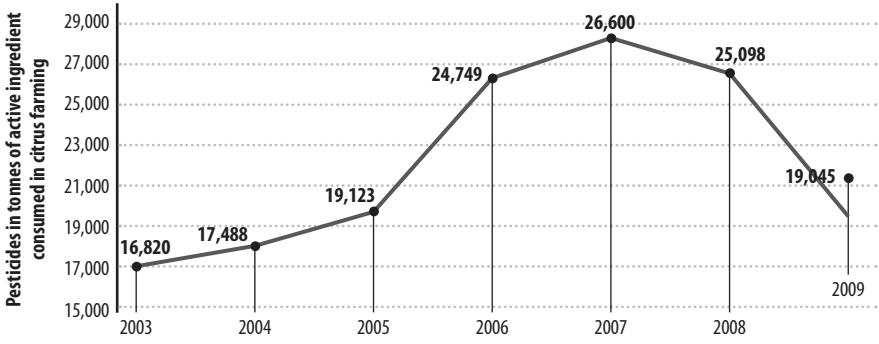


FIGURE 10: Evolution in pesticide consumption in citrus cultivation, from 2003–2009



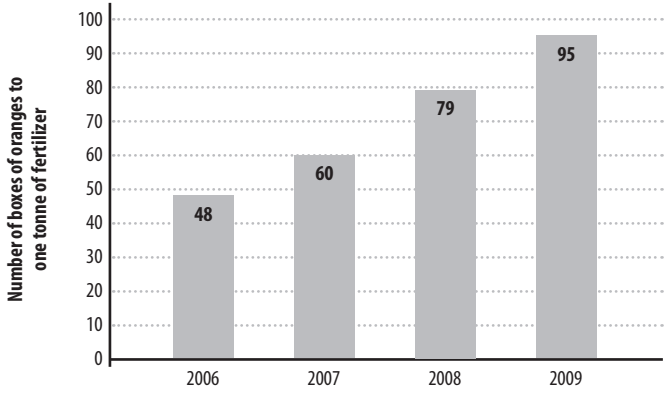
Source: Elaborated by Marketstrat with data from SINDAG (2010).

With regards to fertilizers, citriculture is responsible for only 2% of the total consumption in Brazil, after 11 others. In terms of intensity of use, citriculture ranks sixth, applying 362kg/hectare in 2009, a reduction of 10.2% in relation to 2008, and of 26.3% for 2007. This is partly justified by a worsening in the exchange ratio between a tonne of fertilizer and a 40.8kg box of oranges. In 2007, it took 60, 40.8kg boxes of oranges to buy one tonne of fertilizer, and in 2009 it took 95 boxes (Figure 11).

Orchards

Citriculture is present in almost every Brazilian state. With more than 800,000 hectares of orchards, oranges are the most cultivated fruit in the country, occupying about half of the planted area of fruit in Brazil. This is about two times larger than the area of bananas; 11 times greater than the area of grapes; and 20 times greater than the area of apples. About 80% of the cities in the state of São Paulo have orange trees in parts of their areas, but expansion has been occurring more intensively in the state of Bahia, Minas Gerais, Paraná and Sergipe. This is due to a rise in demand for fresh fruits from inhabitants of the north and north-east regions of Brazil. This also reflects an increase in their purchasing power.

FIGURE 11: The exchange ratio between a tonne of fertilizer and 40.8kg box of oranges.



Source: Elaborated by Markestrat with data from ANDA (2010)

Oranges can have three basic destinations: The processing industry, the internal market and the external market. In the states of Bahia and Sergipe, 77% of production is absorbed by the fresh fruit market. In the Brazilian citrus belt (the Brazilian citrus belt includes the state of São Paulo, Triangulo Mineiro and north-west Paraná), 86% of production is destined for the processing industry. This is due to the characteristics of the oranges, which allow the industry a high efficiency in its conversion into FCOJ at 66°Brix.

The citrus fruit (oranges, lemons/limes and tangerines) revenue in 2008/09 totalled US$2 billion. From the total production, 67% was destined for the processing industry; 32% to the internal fresh fruit market; and 1% was exported as fresh fruit. From the total of oranges processed by the industry, 35% was produced in the industry's farms; 34% was bought from orange producers with pre-established short and long-term contracts; and 31% was bought from orange producers on the spot market.

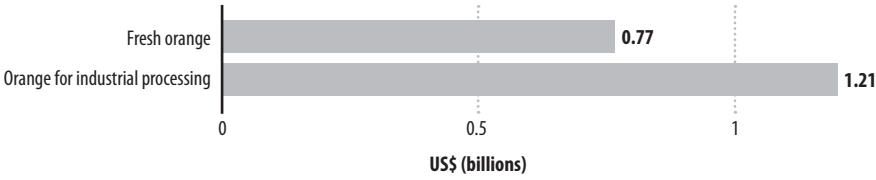
Despite the fact that areas cultivated with oranges in Brazil have reduced by 8% since the beginning of 1990, production has increased by 22% during the same period. This is owing to a dramatic increase in productivity. In 1990, the national average for productivity was 380 boxes per hectare. In 2010 it increased to 475 boxes per hectare. A significant part of this increase is justified by the changes in the citriculture technological practices, which are more enhanced on the citrus belt. This region currently outputs over 80% of the national citrus production. Although it is a continuous area, there are some particularities to each location.

In order to simplify the study and for a better understanding in this research; following recommendations of specialists in the sector; the citrus belt was divided into five different production regions. These are illustrated in Figure 13, which also pinpoints where the processing industries are located.

Among the changes observed in the technological practices, it is important to note the increase in tree density within the orchards. In 1980, the average planting density was 250 trees per hectare. In 1990, it was 357; and in the early years of 2000, it was 476. Currently, some of the modern orchards are planted with 833 trees per hectare. Other significant changes that positively impacted productivity include: The use of nursery trees of better quality, produced in screened nurseries, following strict legislation and guidelines; the diversification of root stock, mainly using Citrumello Shingle, etc; advancements and the

application of expertise aimed at more efficient orchard management; gains in phytosanitary control quality; increases in the use of irrigation systems in areas where water problems are more severe; and new considerations in order to determine the optimum moment to renovate an orchard.

FIGURE 12: Revenue from the sale of orange produce



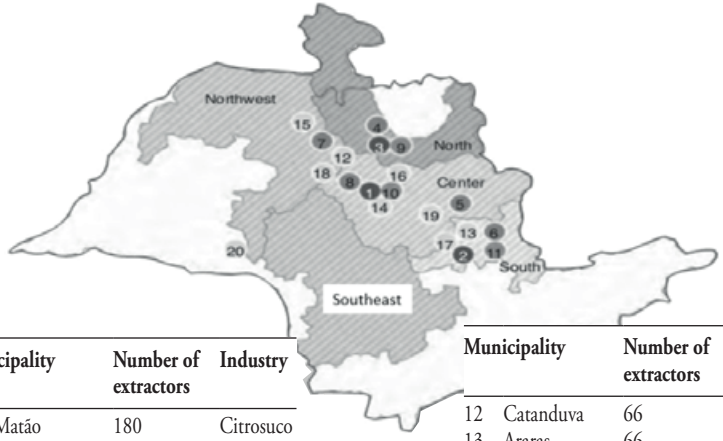
Source: Elaborated by Neves and Trombin with data from Markestrat

Within the citrus belt there was also a migration of the orchards from the regions north, north-west and central to the south, south-west regions. This movement began in 2000 and was initially motivated by more favorable climatic conditions, lower land values, and an absence of threats to the orchards from diseases such as citrus sudden death (MSC) and CVC. Currently, the main motivations for this movement include risk mitigation of HBL, which has already affected 239 municipalities in the state of São Paulo, and the expansion of the sugarcane crop throughout the state of São Paulo to occupy citrus areas that have been presenting lower productivity and inadequate profitability.

In 2002–2009, in the south-west region, the number of trees has increased by 89%, propelling the region from last to second place when it comes to the quantity of trees within the citrus belt. Also, 42% of the new trees (from zero to two years of age) are concentrated in this region. This means that its participation and importance in production will only increase in years to come.

The Brazilian citrus belt can also be characterized according to the growers' profile. The data for such characterization was provided by CitrusBR and based on the producers who delivered oranges to the industry within 2009/10. It allowed for the construction of a producer profile for the first time, according to the industry's records of the area, the number of trees and volume produced.

FIGURE 13: Division of the regions in the citrus belt



Municipality		Number of extractors	Industry
1	Matão	180	Citrosuco
2	Limeira	60	
3	Bebedouro	72	
4	Colina	96	Cutrale
5	Araraquara	84	
6	Conchal	44	
7	Uchoa	42	
8	Itápolis	24	
9	Bebedouro	84	Dreyfus
10	Matão	70	
11	Eng. Coelho	60	

Municipality		Number of extractors	Industry
12	Catanduva	66	Citrovita
13	Araras	66	
14	Matão	56	
15	Mirassol	24	Bascitros
16	Dobrada	12	KB
17	Rio Claro	7	Selial Citros
18	Itajobi	6	Agromex
19	São Carlos	6	Hildebrand
20	Santa Cruz do Rio Pardo	5	Guacho

Source: Elaborated by Markestrat with data from CitrusBR (2010)

TABLE 13: Citriculture production details within the Brazilian citrus belt

Harvest	Productive adult trees over 2 years of age (millions)	Yield (boxes* per tree)	Production (millions of boxes)	Oranges to fresh fruit market (millions of boxes)	Oranges to industry (millions of boxes)	Industrial efficiency (boxes/tonnes of juice**)	Orange juice production (1,000s of tonnes)
2005/06	159.3	1.9	303.4	38.1	265.3	228	1,164.5
2006/07	158.4	2.22	351.0	34.4	316.6	231	1,369.2
2007/08	159.6	2.23	356.0	38.3	317.7	233	1,362.7
2008/09	160.7	2.01	323.3	35.5	287.8	254	1,132.9
2009/10	164.2	1.93	317.4	43.3	274.1	257	1,064.7

*40.8kg boxes
**Orange juice at 66°Brix

Source: Elaborated by Marketstrat with data from CitrusBR and USDA (2010)

The results show that 87% of producers belonging to the citrus belt can be categorized as small (a total of 11,011 producers), with properties that have up to 20,000 trees, responsible for 21% of all trees. A total of 11% of producers (1,496) are categorized as medium-sized, with properties having from 200,000 –199,000 trees, containing 32% of all trees. Only 2% are categorized as large producers (120), with properties that have over 200,000 trees, containing 47% of all trees.The data also makes it possible to observe the increase in the number of trees, and the increasing participation of large growers. This is explained by the economy of scale obtained in larger properties, which allows for gains in competitiveness due to a more efficient use of technology and orchard management. In other words, inefficient producers will be forced out of action due to their inability to compete with other players in the market. The growers and producers that remain in citriculture must find the most appropriate path for their profile. They must then determine a strategy to be followed – be it low-cost, differentiation or diversification.

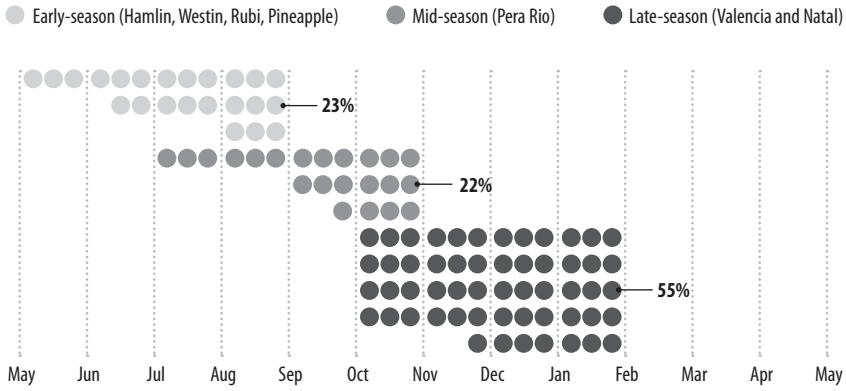
Citrus varieties

The diversification of citrus varieties in an orchard is important because it allows growers to sell part of their crop during months with higher prices, and also enables the industry to increase the fruit-processing period. It is also a way to improve pest and disease management and to reduce the impact of adverse climate conditions.

Currently, the orchards located in the state of São Paulo grow 55% of late-season sweet orange varieties (Natal and Valencia), 23% of early-season varieties (Hamlin, Westin, Rubi and Pineapple) and 22% of mid-season varieties (Pera) (Figure 14). The preference for the late-season varieties is due to their higher yield and the soluble solids in the juice. But this situation has created a gap for mid-season varieties, which have excellent characteristics for the fresh fruit market, thereby increasing competition for oranges between the industry and the fresh fruit market during the month of September.

It has been observed that in new orchards (ages 0–2 years), the percentage of early-season varieties has increased to 29%. This indicates that growers are changing their orchard profiles in order to reduce the supply deficit from May to August. However, the gap in mid-season varieties still remains.

FIGURE 14: Harvesting season by citrus orange variety and participation in the total production



Source: Elaborated by Markestrat with data from CitrusBR (2010)

The financial impact of diseases in the Brazilian citrus belt

Undoubtedly, citrus diseases are one of the biggest threats to Brazilian citriculture. Over the last decade, four diseases (citrus canker, CVC, MSC and HLB) alone were responsible for eradicating 39 million trees within the citrus belt. This increased the mortality rate from 4.5% to 7.3%, reducing annual production to approximately 78 million boxes of 40.8kg, when considering an average productivity of two boxes per tree. This figure represents 25% of the 2007/08 harvest of 317 million boxes of 40.8kg (Table 13).

Post orchards

The inputs acquired by packing houses and juice factories for citrus processing totalled US$360.9 million. Electricity represented 24% of the total value ,and BPF oil/bagasse, for 25% (BPF oil is a fuel oil used by industry).

In 2008/09, packing house revenue from fresh fruit was US$1.8 billion – 96% of which was obtained in the internal market. Fresh fruit wholesale revenue was US$1.7 billion, and the retailers obtained US$3.8 billion, of which 58% came from orange sales, 17% from lemons/limes and 25% from tangerines.

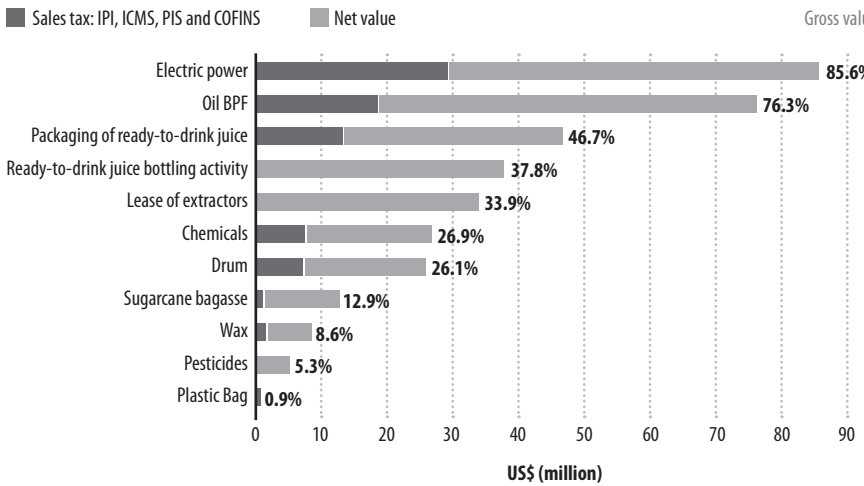
Juice and sub-product sales totalled US$2.2 billion, of which 95% was obtained in the external market and 5% in the internal market. From the revenue gained from exports (US$2.07 billion), 86% came from orange juice. This value represents around 3% of the country's agribusiness exports. Bottling companies, wholesalers and retailers presented the following revenue with orange juice or nectar, respectively: US$255.7 million, US$33.9 million and US$459.1 million.

TABLE 14: Number of thousand trees eradicated in the citrus belt as a result of four diseases, from 2000–2009

Disease	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Citrus canker	795	191	71	164	177	153	186	151	115	240	2,243
CVC	678	2,406	2,380	1,023	2,887	4,043	3,320	3,299	3,276	3,070	26,382
HLB	–	–	–	–	–	–	–	5,330	–	–	5,330
Sudden death	–	–	–	–	5,158	–	–	–	–	–	5,158

Source: Elaborated by Marketstrat with data from Fundecitrus and CitrusBR (2010)

FIGURE 15: Sales of the industrial inputs link of the supply chain in the Brazilian citrus industry, 2000/2009



Source: Elaborated by Neves and Trombin with data from Markestrat

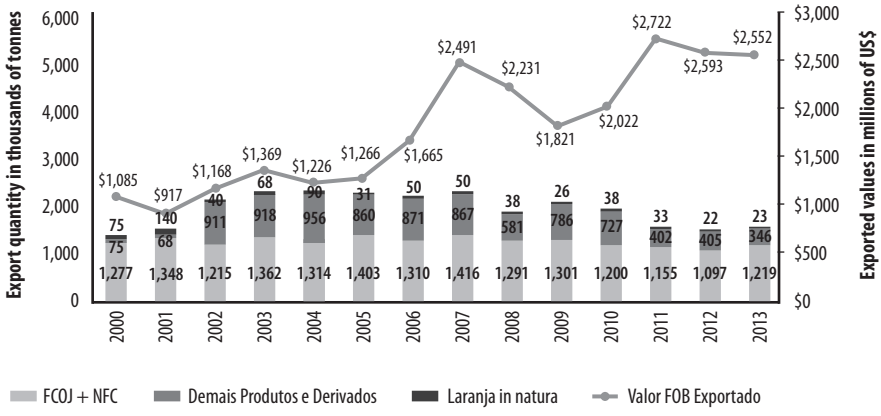
The numbers obtained for the Brazilian citrus industry are impressive. Brazil comprises 53% of the world's orange juice production and exports 98% of its production of this commodity. Between 1962 and 2009, citriculture accumulated almost US$60 billion in export revenues, bringing in an average of US$1.3 billion per year in foreign exchange.

In 2002, the Brazilian citrus industry took an important step by beginning NFC exports. This showed the industry's capacity to innovate before a change in consumer habits – switching to less processed products with a more natural image.

NFC has a more pleasant taste because its flavor is closer to fresh orange juice, and its image is associated with a healthier product.

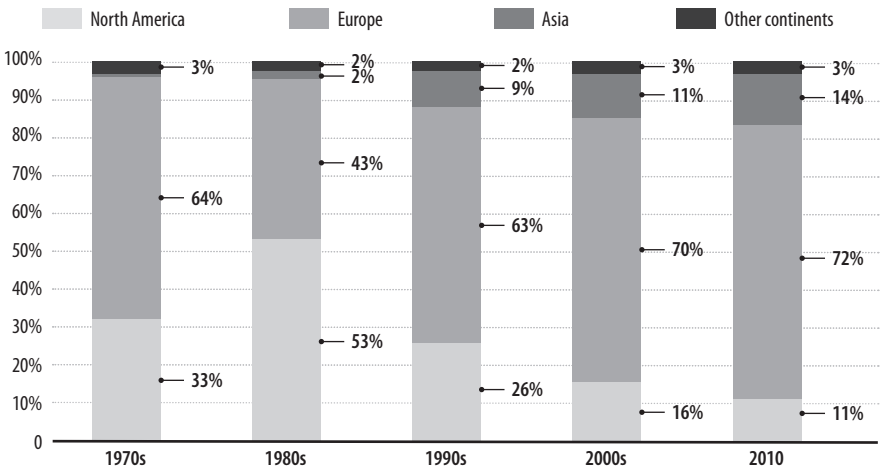
This same innovation capacity was again demonstrated over the past decade with the diversification of the exports destination as a response to the citrus industry's search for new and non-saturated markets. Traditionally, Europe and USA imported more than 90% of Brazil's orange juice exports. Currently, the most promising markets for growth potential are Asia, due to its population, and the Middle East – mainly because of the population's habit of not consuming alcohol. In 2009, Brazil exported orange juice to 70 different countries, of which 20 imported NFC (Figure 17).

FIGURE 16: Brazilian citrus complex exports, from years 2000–2009.



Source: Elaborated by Markestrat with data from SECEX/MIDC (2014)

FIGURE 17: Brazilian FOCJ export destinations, by decade and in the year 2010



Source: Elaborated by Markestrat with data from SECEX/MIDX (2014)

In addition to the demand for less processed products, and the need to search for new and non-saturated markets, the citrus industry export is also challenged by tax policies and phytosanitary and technical barriers, which reduce its competitiveness in the international market.

With the exception of the USA, where Brazilian orange juice is taxed at a fixed value per tonne, in other continents and countries, such as in Europe, Japan, South Korea, China and Australia, the tax value is calculated as a percentage of the financial volume imported. This tends to amplify the effect of a rise in orange juice prices in the international market to the final consumer. Once orange juice prices rise, more taxes will be paid for the same quantity of the commodity. In 2009, orange juice exports from Brazil were taxed by US$260.4 million.

Phytosanitary and technical barriers are related to package characteristics, consistency in product quality, and punctuality in delivery. In Europe, for example, the main demands are food security (consumer health, contaminant levels and pesticide residues); quality (sensational appeal and compliance with technical specifications); authenticity (adulteration and compliance with the legislation); traceability (product identification and readiness in identifying

the source of any potential problem); and consumer perception (product image and origin).

Facilitating agents

The revenue for facilitating agents in the citrus production chain in 2008/09 was US$877.5 million. On average, when it came to transportation, more than six trucks per hour passed through a toll booth on their way to the Port of Santos in São Paulo state. This made it possible for highway concessionaires to garner revenues of US$18.5 million, corresponding to 5% of all freight expenses paid by the citrus sector, totalling US$396 million. Diesel represented 9% of this total.

Freight can be divided into primary transportation from orchards to packing houses or the processing industry. This showed a total revenue of US$171.4 million. Secondary freight transportation, from packing houses to wholesalers or retailers, totalled revenue of US$137 million; and to the port, US$2.7 million revenue. Secondary freight can also refer to transportation between the processing industry and port, with total revenue of US$85 million.

Regarding port costs, it is estimated that in 2008, the Port of Santos earned US$71 million from storing oranges in warehouses and loading them on ships. It is important to state that 97% of Brazil's orange juice exports were shipped through the Port of Santos.

Regarding payroll, the agricultural year 2008/09 ended with 132,776 employees in the citrus sector, of which 121,332 were registered in fruit production activities, and 11,444 in the juice industry. During this period, more than 69,000 workers were hired, contributing to the US$352.7 million paid in salaries and benefits.

Aggregated taxes

Total tax expenses were calculated by adding the taxes generated in each segment of the production chain: From the sales of agricultural and industrial inputs to the sales of final goods. From this total, taxes generated at the

beginning of the production chain (agricultural and industrial inputs) were subtracted to eliminate double counting and to consider the aggregated taxes in the production chain.

The results of this estimate indicate that taxes charged to the citrus production chain totalled US$339.4 million, of which US$150.6 million were generated by agricultural and industrial inputs sales. This means that aggregated taxes were estimated at US$188.7 million.

3.5 Conclusion

This work was able to present a method for both the quantification and mapping of productive chains, and to discuss some relevant findings for its applications in the citrus chain in Brazil.

It has been that noted that the ChainPlan method has been an effective tool to demonstrate the importance of the financial activities of a production chain. This paper also shows an overview of the current situation of Brazilian citriculture, with discussions about the most relevant subjects impacting the sector.

Brazil has achieved high efficiency in the citrus production chain. This efficiency includes everything from certified nurseries, to the planting and cultivation of oranges, to the production and international distribution of orange juice. This is done through integrated bulk cargo systems that include tanker-trucks, port terminals, and dedicated ocean vessels that ship citrus products to consumers in Europe, North America and Asia. These products have dozens of different specifications and blends for the most diversified applications and unmatched excellence. This process is undertaken with full Brazilian competence and know-how.

Brazil produces half of the orange juice on the planet. The exports bring in US$1.5–2.5 billion to Brazil each year. In roughly 50 years, the supply chain has brought to Brazil nearly US$60 billion (at today's prices) directly from the world's orange juice consumers.

This wealth is distributed to hundreds of enterprises directly involved in the sector: Thousands of orchards generate more than 200,000 direct and

indirect jobs, paying taxes, and serving as a driving force for establishments and many other companies located in nearly 400 municipalities in the state of São Paulo, accounting for 80% of Brazil's overall production. In fact, oranges are grown in more than 3,000 municipalities across Brazil.

This papers also highlights the citrus industry's strengths, as well as its social and economic importance. It also points to some of the major challenges for the future. The changes that occur throughout the Brazilian citrus production chain have the same origin: The understanding that the final consumer doesn't want to, and will no longer pay for, the inefficiencies of the supply chain. These new demands have brought new challenges that will not be solved under the assumption of an isolated and static system. It will take the co-ordination of the production chain as whole and its never-ceasing search for efficiency and low costs to stimulate the performance of all links that comprise the chain.

4

THE NEW METHOD OF CITRUS FORECASTING IN BRAZIL[3]

4.1 Introduction

This paper presents the methodology and results of the first study of the citrus tree inventory and the orange crop forecast conducted by Fundecitrus, with the co-operation of Markestrat, FEA-RP/USP and the Exact Sciences Department of FCAV/Unesp, during the period from October 2014 to May 2015.

In order to establish a transparent and reliable method, several meetings were held to discuss methodologies and to share knowledge with representatives from the government and from the orange juice companies (Citrosuco, Cutrale and Louis Dreyfus). Committees were organized comprising citrus growers, representatives of the orange juice companies, attorneys and scholars, who discussed the actions, goals and indicators in order to propose technical improvements for conducting activities. Throughout all the work phases, there was compliance with antitrust practices, through the adoption of measures necessary to prevent any sharing of sensitive information and competitive content among the participating orange juice companies, and between them and the citrus growers.

3 Contributions of Marcos Fava Neves, Vinícius Gustavo Trombin, José Carlos Barbosa, Antonio Juliano Ayres, *Fruit Processing* (Jan–Feb 2016)

4.2 Survey method for citrus tree inventory

The method for citrus tree inventory can be divided into four phases: (1) Gathering of satellite images; (2) Collection of data at the groves; (3) Verification of the data at the office and in the field; (4) Organization of data for publication.

4.2.1 GATHERING OF SATELLITE IMAGES

Collection of satellite images covered 152,000km^2 in 481 municipalities in the state of São Paulo, the west-south-west of Minas Gerais. These views were obtained by the satellites Pléiades 1A and 1B, owned by French operator Airbus Defence and Space between May 1 and October 31 2014. The spatial resolution of the views is 50cm per pixel, orthorectified, geo-referenced into geographical co-ordinates with Datum WGS 84.

4.2.2 DATA COLLECTION AT THE GROVES

High definition satellite images were provided to the study agents. Before going into the field, these agents conducted a sweep, or visual inspection, of the images. To ensure that the groves were detected, the agents sought information about the location of recent plantings from agricultural technicians, co-operatives, and citrus growers.

The agents went into the fields. If the owner, or person responsible, could not be found after several attempts, or did not authorize them to enter, the data for these groves was estimated, based on the remote sensing and statistical inference. If these producers provided information on their groves without allowing the agents to enter to do their work, this data was submitted to the same remote sensing and statistical inference processes in order to ensure the reliability of all the data collected.

The design of the shape of each block was placed over the images. The areas relative to any improvement inside the blocks, such as main buildings or dams, were discounted, and thus the net areas of each block were obtained.

The configuration of planting was also collected. For this purpose, measurements were taken of the spaces between lines and between plants

located in the center of the blocks, and then the densities were calculated to estimate the number of holes in each block.

Producers, or those responsible for the grove, were asked to provide information on the variety and planting year. In some cases, recognition was done in the field by the agent himself. Finally, data was collected at each of blocks on the use and method of irrigation.

In this phase of citrus grove registration, no data was collected that could identify the owner or the grove by name, in order to protect the privacy of the citrus grower. Confidentiality policies and restricted access were also established for all collaborators, in order to guarantee the reliability of the individualized data.

4.2.3 FIELD AND OFFICE DATA VERIFICATION

Data refining consisted of the counting and classification all the holes existing in blocks that were randomly assigned. The sampling was proportionately stratified. It covered 5% of the blocks mapped. Due to the technique used for the drawing, the blocks of the citrus belt were subdivided into 240 strata. The random sample drawing respected the proportion in relation to the number of trees of each stratum. The stratification variables were 12 regions, five variety groups and four age groups.

Based on the counting and classification results, four indexes were generated for each stratum: Bearing trees; non-bearing trees; dead trees and vacancies. The indexes were prepared based on the total number of each of the elements counted in relation to the total number of existing holes. Later, the indexes obtained in the sampling were applied to all the holes in the respective stratum. Before applying these indexes, the mapped area was corrected by the eradication found in the sample.

4.2.4 ORGANIZATION OF DATA FOR PUBLICATION

After undergoing verification, the data collected was gathered and organized into regions, variety groups and age groups. The data in each block or grove was not published individually, in order to preserve the privacy of each citrus grower.

4.3 Objective survey method for orange production forecast

The orange production forecast was conducted using the objective method: Based on field measurements, counting and weighing of fruits per bloom. The direct expansion method, which uses four components, was chosen:

$$\text{Production forecast} = \frac{\text{Bearing trees} \times \text{fruit per tree} \times (1 - \text{fruit loss from droppage})}{\text{Fruit size}}$$

4.3.1 BEARING TREES

The varieties covered in the forecast represent 97% of the total sweet orange-growing area, and are the following: Hamlin; Westin; Rubi; Valencia Americana; Valencia Argentina; Seleta; Pineapple; Pera Rio; Valencia; Valencia Folha Murcha and Natal.

4.3.2 FRUIT PER TREE

In order to forecast the productivity of the orange trees, 2,500 trees were drawn by the stratified sampling technique, proportional to the number of trees of each stratum. To determine the sample size, researchers used the variance of the historical number of fruits per tree, considering an expected error of 2–3% of the average.

The factors used for stratification of the citrus belt were: Region, variety and age. The combinations of these factors led to 180 strata.

In order to obtain the number of fruits per tree, a stripping procedure was conducted on each of the 2,500 trees drawn. This operation consisted of advanced harvesting of all fruits from the tree, independent of the bloom.

Five blooms were identified in the samples, and for the purpose of forecasting, fruits from the first, second, and third blooms were used. A fruit setting rate of 40% was used for the fourth bloom. Fruits from the fifth bloom were not considered in the forecast.

4.3.3 FRUIT LOSS FROM DROPPAGE

Not all of the fruit produced by an orange tree reaches harvest, due to natural droppage; pests and diseases; hydric stress; excess rains; hail; very high or very low temperatures; and other factors. For this reason, Fundecitrus conduct monthly observations in a subsample of 900 blocks drawn from the 2,500 used in the stripping. This monitored fruit fall in trees neighboring the stripped trees during the period from June 2015 until the final harvest of these blocks. This fruit loss from droppage, measured in the season itself, was used to correct the forecasted rate, and consequently, the forecasted productivity.

However, in order to prepare this first forecast, the rate of fruit loss from droppage and the number of fruit sizes was forecasted based on the historical data from the 2004/2005 to 2014/2015 seasons, provided by the orange juice companies that are members of Fundecitrus and who have been conducting research themselves in the citrus belt since 1988. This data was crossed with the fruit that entered their factories for processing.

The average weighted fruit loss from droppage of the trees used in this first forecast was 17%, from which 11% was related to the early varieties; 17% to the Pera Rio variety; and 20% to the late varieties.

Based on the average deviations from orange production forecasts of the citrus belt over the past 10 years, the correction factor was forecasted to be 5%, which is mainly justified by pest-triggered premature fruit drop and uneven age of bearing trees (resets that have already reached producing age).

4.3.4 FRUIT SIZE

The development and growth of the fruits from the start of the season until they reach the ideal maturity for harvesting for industrial purposes, or for consumption *in natura*, vary greatly from one season to another.

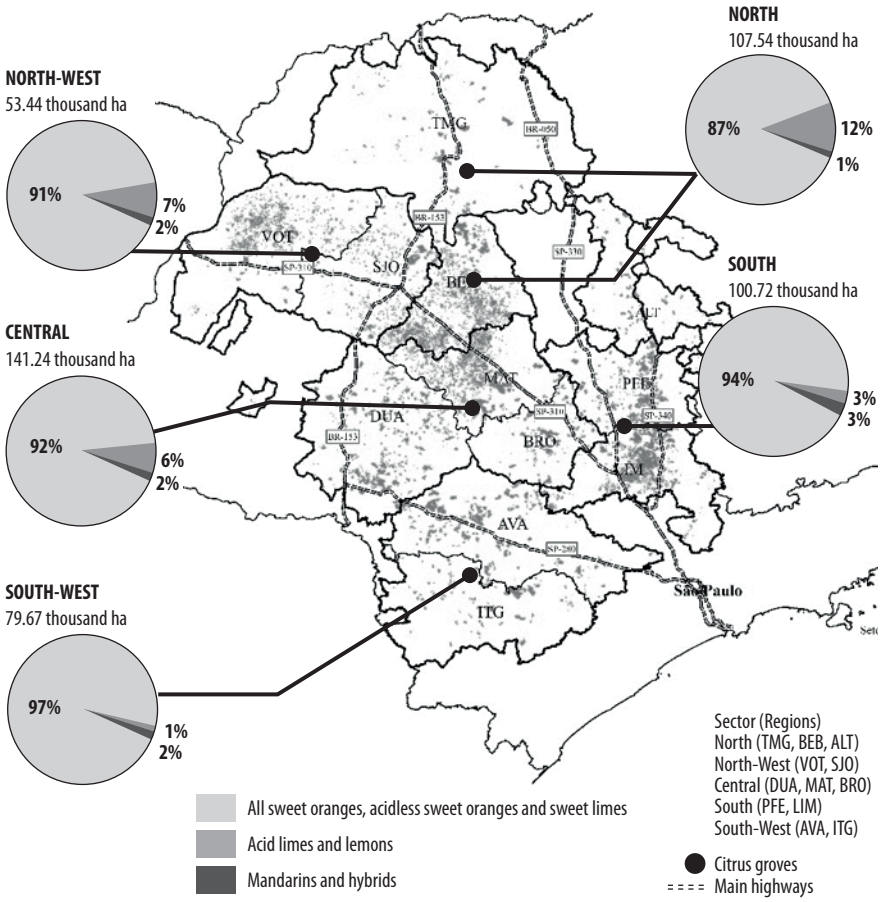
As a result of the need to understand the variability of this factor in different seasons, the professionals chosen for this forecast analyzed the data of a historical series of 17 years, provided by agents in the production chain.

The weighted average size of the fruit used in this first forecast was 245 fruits to fill a 40.8kg box, where: 270 for Hamlin, Westin and Rubi; 245 for Valencia Americana, Valencia Argentina, Seleta and Pineapple; 254 for Pera Rio; 229 for Valencia and Valencia Folha Murcha; and 230 for Natal.

4.4 Results

This study resulted in a snapshot of the groves in March 2015, thus providing a reliable view of citrus growing in the citrus belt for this date. The total area of citrus groves is 482,591 hectares in the citrus belt and is distributed among 11,561 groves located in 349 municipalities in the state of São Paulo, the west-south-west regions of Minas Gerais. Figure 18 shows the citrus groves in the belt.

FIGURE 18: The citrus belt subdivided into sectors, with emphasis on the grove areas



Covering 444,585 hectares, oranges (sweet oranges, acidless sweet oranges and sweet limes) are the most frequently planted citrus fruit, followed by acid limes and lemons, covering 27,938 hectares, and mandarins with 10,070 hectares. Of all the 349 citrus-growing municipalities, only three exclusively produce mandarins,[4] and only one[5] exclusively grows acid limes or lemons.

The most important sweet orange varieties in the citrus belt are: Hamlin; Westin; Rubi; Valencia Americana; Valencia Argentina; Seleta; Pineapple; Pera Rio; João Nunes; Valencia; Natal; and Valencia Folha Murcha. These varieties account for 97% of the orange area and were compiled into a group called "Oranges".

In a lesser proportion, in the remaining 3% of the area, the varieties of Washington Navel, Baianinha, Shamouti, acidless sweet oranges and sweet limes are grown. Except for the planted area, all of the other information on the orange groves in this publication refers to the most common varieties.

The orange trees of the most common varieties total 174.13 million fruit-bearing trees, and 23.73 million non-bearing trees.

In relation to the sweet orange-producing trees, 22% are between three and five years old, 45% are between six and 10 years old and 33% are more than 10 years old. The average age of a mature grove is 9.8 years. More than half of the bearing trees are located in only four regions: Avaré (AVA), Bebedouro (BEB), Duartina (DUA) and Limeira (LIM).

Analyzing the age of the plantings, we conclude that Matão (MAT) is the region that proportionately has the largest number of non-bearing trees. Another relevant aspect refers to the calculation of the number of trees that were planted before 2013 to replace trees originally planted. In other words, reset trees that have already reached their bearing phase, which total 2.776 million (1.6% of the total).

The average size of a citrus grove is approximately 42 hectares, with blocks measuring 8.50 hectares on average. Groves with less than 100,000 sweet orange trees account for 91% of the total number of citrus groves in the belt, and groves with up to 500,000 trees account for 98%.

4 Bastos-SP, Iacri-SP and Parapuã-SP.

5 Iturama-MG.

TABLE 15: Orange production forecast and its components, by variety group

Variety group	Mature groves area	Average density planting[1]	Components of May/2015 forecast				Orange production forecast 2015–2016		
			Bearing trees	Fruits per tree at stripping	Fruits forecast by box[2]	Fruit loss from droppage forecast	By tree	By area	Total
	(hectares)	(trees/ hectare)	(1,000 trees)	(number)	(number)	(number)	(boxes/ tree)	(boxes/ hectare)	(1,000,000 boxes)
Early season:									
Hamlin, Westin Rubi	68,052	440	28,786	672	270	11	2.10	888	60.43
Other early season:									
Valencia Americana, Valencia Argentina, Seleta, Pineapple	18,710	438	7,860	524	245	11	1.81	758	14.18
Mid-season:									
Pera Rio	128,572	472	58,495	398	254	17	1.24	563	72.35
Late season:									
Valencia e V.Folha Murcha[3]	141,326	441	60,006	485	229	20	1.60	681	96.25
Natal	46,832	418	18,979	572	230	20	1.89	764	35.78
Average	(X)	448	(X)	498	245	17	1.60	691	(X)
Total	**403,492**	**(X)**	**174,126**	**(X)**	**(X)**	**(X)**	**(X)**	**(X)**	**278.99**

(X) Not applicable
1 The calculation considers the total number of trees of the block: Bearing and non-bearing trees (2013 or 2014 resets).
2 Weighted average per stratum area.
3 V.Folha Murcha – Valencia Folha Murcha.

Important differences can be seen between the groves planted in recent years and older groves. Those more than 10 years old show density planting of 364 trees/hectare, while young groves – those with trees are not yet three years old – have 631 trees/hectare. The number of trees per hectare in the young groves is 37% higher than the weighted average, which is 459 trees/hectare. Another notable difference is the variety according to the planting year. While the Pera variety stands out in younger plantings, the most common variety in the older plantings is the Valencia.

The area of irrigated orange groves totals 105,788 hectares, which corresponds to 24.6% of the total orange area, with irrigation predominating in the Bebedouro (BEB) and the Triângulo Mineiro (TMG) regions and in groves less than 10 years old. The most commonly used irrigation method is the localized method, used in 88% of irrigated areas. More than half of the irrigated area is in groves covering more than 500 hectares.

The 2015–2016 orange production forecast, published on May 19 2015, was 278.99 million boxes (40.8kg), as presented in Table 15.

4.5 Major takeaways

Since its presentation at the Juice Summit in Antwerp (October 2015), several other countries with fruit production showed interest in replicating this method. A sequence of steps is proposed here to better enhance understanding and allow for the replication of what was done in Brazil.

1. Problem, idea proposal and chain acceptance
2. Project design, governance and budget
3. Physical structure and team hiring
4. Designing the method for tree mapping and crop estimates
5. Field work for tree mapping and crop estimates
6. Publishing and communication
7. Reviews and improvements

The orange juice chain in Brazil provided a good example to the world of how the private and public sectors can join forces and solve the problem of a lack of information, to create just one crop estimate that is accepted by all chain participants (suppliers, producers, industry and facilitating agents) and by the government. The project is increasing in efficiency as confidence and co-ordination efforts increase, to the benefit of all participants.

5

BRAZILIAN ORANGE PRODUCTION FOR THE 2016–2017 SEASON[6]

5.1 Introduction

As described in January/February issue of *Fruit Processing* (Neves et al., 2016), the PES (Production Forecast Research) is a good example of what the Brazilian orange juice supply chain gives to the country and to the world. This project put an end to a decades-long publication of conflicting data about the number of productive trees in the citrus belt and in estimates of total orange production.

In its second year, we could dramatically ease the learning curve and reduce the number of conflicts and negotiation situations that wore us down in the first year. The confidence among agents grew (citrus growers more easily allow agents to enter to the groves), Fundecitrus has been empowered and has involved two of the most important universities in Brazil (USP and UNESP). It should be our main organization in the citrus industry. The PES project and method was presented to the world at the Juice Summit in Antwerp in 2015. This is a gathering of all the world's industry, from the fruit processors to the packers of the consumer drinks (over 400 people). The project was also presented to the USA's orange supply chain in Lake Alfred (Florida) in January this year, to scientists from the University of Florida and the USDA. The method was published in the International Agribusiness Congress (Minneapolis, 2015, and approved to be presented in June, 2016 in Aarhus, Denmark).

6 Marcos Fava Neves, Vinicius Gustavo Trombin, Lourival Carmo Monaco, Antonio Juliano Ayres, José Carlos Barbosa, *Fruit Processing* (Jul-Aug 2016)

5.2 Objectives and method

The objectives of this article are to show the major results of the PES project in the fruit processing community.

The method was described by Neves et. al. (2016). We had our first crop forecast announcement for 2016–2017 at Fundecitrus (Araraquara, SP, Brazil) on May 10 2016.

The project involved 127 researchers, covering over 476,000km, a work that gathered not just Fundecitrus, but also Markestrat, FEA-RP/USP and UNESP.

5.3 Results: Orange production forecast for the 2016–2017 season of the Brazilian citrus belt

The area of orange groves, including all varieties, is 416,843 hectares – 6.2% smaller than the 2015 inventory. The orange groves implemented in 2015, which added 9,583 hectares, were included in that year's inventory. The ones that were removed or abandoned totalled 37,465 hectares. We had a considerable reduction of 27,882 productive hectares between 2015 and 2016. This area probably migrated to sugarcane and other cultures.

The abandoned groves of the most common varieties, which account for 97% of the orange area, total 6,511 ha, contributing negatively to the health of the citrus belt. There are 175.55 million bearing trees and 16.46 million non-bearing (considering 11.26 million young groves and 5.2 million reset trees). In total, we have 192.01 million trees in the belt. Of those, 66.0 million (34.4%) are more than 10 years old; 73.8 million (38.4%) are 6–10 years old; 35.7 million (18.6%) are 3–5 years old; and 16.46 million (8.6%) are one to two years old. Compared to last year, the bearing trees increased by 0.8%, and the non-bearing ones (one to two years old) fell by 30.6%. This revealed minor renovation in the citrus industry.

Over 90% of the citrus belt consists of four groups of varieties: Pera Rio with 34% of the total orange trees; Valencia (including Folha Murcha)

with 32.85%; Hamlin (including Rubi and Westin) with 15.36%; and Natal with 10.73%. The distribution by maturity stage of varieties shows that 39.06 million trees are early-season varieties (harvested between May and August); 66.62 million are mid-season (harvested between July and October) and 86.33 million are late-season varieties (harvested between October and January).

The average density of young groves is 654 trees/hectare, maintaining the level of 600 trees/hectare reached since 2013. The average density of mature groves – in other words, the ones implemented before 2014 – is 467 trees/hectare. This is a 4.24% increase from the previous inventory. The older groves have lower average density (groves more than 10 years old have an average of 392 trees/hectare).

The average age of mature groves is 9.8 years old, which shows a relatively young park. However, 35,566 hectares, or 9% of bearing trees, are 20 years old or more. The average density of this portion of groves is 336 trees/hectare. The young groves reached 781 trees/hectare (Altinópolis region).

From the total of 7,558 orange groves, 5,542 groves, or 71.72%, have less than 10,000 trees, and it goes up to 82.93%, if you consider the groves that have up to 20,000 trees. This 82.93% of groves account for 16.17% of the total number of trees in the park. Therefore, the remaining 1,295 groves, which have more than 20,000 trees each, are 17.07% of the total of groves, but gather 83.83% of trees. Around 314 groves own 60% of the trees in the belt. The use of irrigation technology is present in almost 100,000 hectares – about 25% of the area.

The orange production forecast is 245.74 million boxes (90 pounds, or 40.8kg), as presented in Table 16. The total includes 45.86 million boxes of Hamlin, Westin and Rubi varieties; 13.48 million of Valencia Americana, Valencia Argentina, Seleta and Pineapple; 70.38 million of Pera Rio variety; 84.48 million of Valencia and Valencia Folha Murcha varieties and 31.54 million of the Natal variety.

The average productivity per tree was reduced by 19.1%, to 1.40 boxes/tree, against 1.73 trees in the last crop. The productivity per area also dropped by 14.8% (from 745 boxes/ha to 635 boxes/ha). About 22 more fruits per box (from 226 to 248) was possible, with an estimated rate of droppage slightly lower (17.49% to 15%).

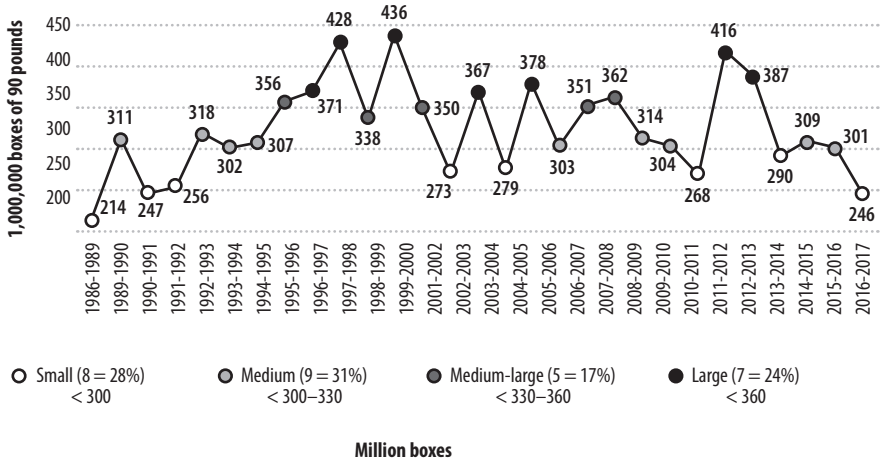
TABLE 16: Orange production estimate for the 2015–2016 and 2016–2017 seasons

Overview of orange production for the 2015–2016 and 2016-2017 seasons	Mature groves		Components of forecast				Orange production forecast		
	Area	Average density planting[1]	Bearing trees	Fruits per tree at stripping	Fruits forecasted by box[2]	Fruit loss from droppage forecast	By tree	By hectare	Total
	(hectares)	(trees/ hectare)	(1,000,000 trees)	(number)	(number)	(percent)	(boxes/ tree)	(boxes/ hectare	(1,000,000 boxes)
2015–16 season: Final orange production estimate (February forecast)									
All varieties	403,492	448	174,126	498	226	17.49	1.73	745	300.65
2016–17 season: Orange production forecast by variety (May forecast)									
Hamlin, Westin and Rubi	64,943	452	28,304	523	275	10	1.62	706	45.86
Other early season	18,317	464	8,256	475	245	11	1.63	736	13.48
Pera Rio	124,379	493	59,668	378	255	16	1.18	566	70.38
Valencia and Folha Murcha.	134,350	463	60,432	409	230	17	1.40	629	84.48
Natal	44,710	435	18,888	500	235	17	1.67	705	31.54
Total/average	**386,699**	**467**	**175,548**	**430**	**248**	**15**	**1.40**	**635**	**245.74**
Change between seasons									
Change	**▼ -4,2%**	**▼ -4,2%**	**▲ +0.8%**	**▼ -13.7%**	**▲ +22**	**▼ -2.49%**	**▼ -19.1%**	**▼ -14.8%**	**▼ -18.3%**

(X) Not applicable.
1 Considers the total number of trees of the block: Bearing and non-bearing trees (2014 or 2015 resets).
2 Weighted average per stratum area.

The 2016–2017 orange production forecast is 18.26% lower than the last crop (300.65), and the lowest of the last 28 years, as shown in Figure 19.

FIGURE 19: Final orange production of the crop years 1988–1989 through 2015–2016, plus forecast for the 2016–2017 season



Source: CitrusBR (1998-1989 to 2014-2015) and Fundecitrus (2015-2016 and 2016-2017)

The hot and rainy climate is responsible for the production differences. After the period in which the growing fruits dropped, there was frequent and above-the-historical-average rainfall throughout the citrus belt. These conditions weren't conducive for significant new blooms. While in the previous crop, 60% of the fruits were from the second bloom, this droppage lead us to estimate this crop being almost 80% of the first bloom.

Since the climate impacted the regions in different ways, the variation among regions increased because of the droppage. For example, the south-west region had 600 fruits per tree ,and in the north-west region, 268. Therefore, some regions are doing well and others, badly.

5.4 Final comments

When looking at global orange juice markets, we must realize that besides the numbers seen in Brazil and described in Chapter 3, some analysis should be done of Florida's situation. The United States Department of Agriculture (USDA) increased to 81.1 million boxes this season's Florida crops (2015–2016). The US industry will stop earlier, in May. This generates even more inefficiency because it will increase industrial idleness in other parts of the production chain.

According to Browning (2015), most growers stopped removing plants afflicted with huanglongbing (HLB, also known as citrus greening). In 2015, it is estimated that 100% of groves and at least 70% of trees were infected. The prospects for the coming years are not good if production does not innovate.

In the middle of the year, the bets were on stocks below 300,000 in Brazil. As a conclusion on the May 2016 forecast for the orange production of the Brazilian citrus belt, there were millions less seedlings being planted, reduced areas, and lower renovation. Fruits per tree and their quality are a cyclical issue of productivity and, therefore, of production. Now, smaller areas, fewer plants and less irrigation are structural factors that undermine the future supply potential. In other words, in a year in which the scenario and conditions are favourable, the production potential (because of structural damage) will be lower. This leads to a belief that when we have super-crops, we will hardly reach 340 million boxes.

Finally, with a smaller crop in Brazil and a smaller crop in Florida, even with the drop in demand (in April 2016, there was a 5.8% fall in consumption of juice in the USA once again, compared to the same month the previous year. This was a monumental fall, considering the volume they consume). We will have a period where the supply will be lower than the demand, resulting in lower inventories and higher international prices of FCOJ and NFC. This translates into higher prices for fruit boxes.

The citrus grower who has fruit will be able to offer reasonable prices. This will help pay off debts from previous periods of great suffering. Higher prices, however, will affect an already weakened demand for orange juice. Whether the bottlers will be able to pass this cost on to retailers is an intriguing consideration. Perhaps retailers would be able to reduce margins to keep selling orange juice. In this instance, the scenario has changed.

6

JUICE CONSUMPTION BELOW TWO MILLION TONNES[7]

The phenomenon of a decrease in consumption has been widely studied over the past few years – and it seems to be getting worse. At the close of 2015, for the first time in history, the world demanded less than 2 million tonnes, closing out the year with 1.938 million tonnes of FCOJ consumed.

The fall in consumption is surprising, considering the 14% world population growth, and 63% increase in per capita income. Even unemployment, which is making many Brazilians lose sleep, fell globally from 7.8% to 5.6%. Despite these positive indicators, juice consumption appears to be bucking the trend of strong growth in food markets.

The sharpest fall was the American market, with11% in just a year. In 2014, the US consumed 688,000 tonnes ,while in 2015 it closed with 613,000 tonnes. Over a 13-year period from 2003, consumption in the USA fell 39% (from 1.001 thousand tonnes). The per capita consumption fell from almost 18 liters to 10 liters per person. Later on, we will discuss the American market in further detail.

The annual consumption study conducted by Markestrat (a project and research group formed by professors and postgraduate students of FEARP/ USP, among others) has, as a starting point, the data from the Tetra Pak Compass system – one of the most sophisticated databases in the world. To this information we added other sources, like the Euromonitor, Planet Retail, public data from the American government, and data from other private and public sources, such as FDOC.

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7 Marcos Fava Neves, Vinicius Gustavo Trombin. Fruit Processing (Sep-Oct 2016).

This way, it's possible to create an overview of more than just the volume consumed in the juice category. In addition to 100% products, it also takes into account data from nectars and still drinks, as well as the concentrates and syrups.

The volumes of juice sold for carbonated drinks, like soft drinks, are not included. To get a better look at this market, we isolated the 40 main markets that answer for more than 99% of the world's sales. All liters are converted to the equivalent FCOJ 66°Brix.

Interestingly, only 10 countries account for about 80% of all orange juice consumed.

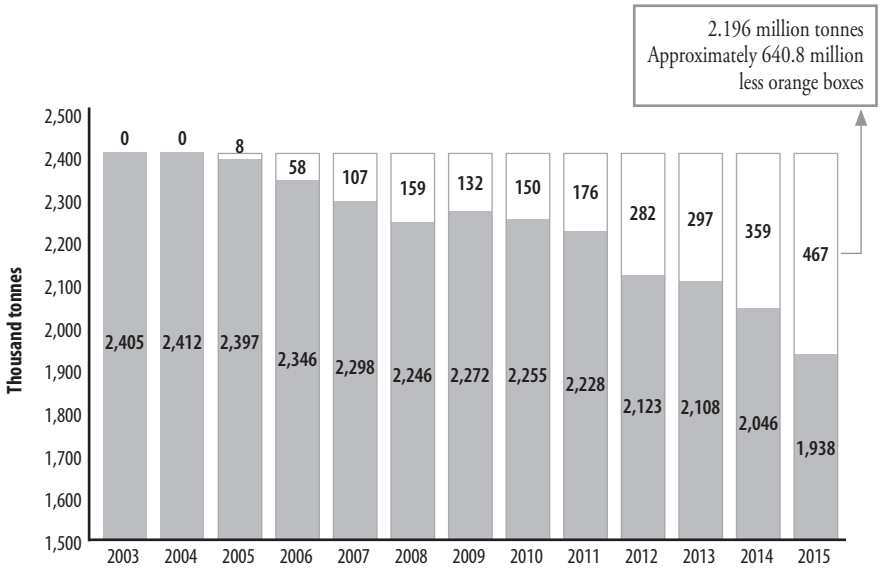
In addition to the United States, other countries reveal problems, too. Germany, the main European consumer, showed a fall of 42% between 2003 and 2015. In France, the drop was smaller, at 8%. China, however, had 189% growth in the same period, despite registering a fall of 6% compared to 2014.

China jumped from 46,000 tonnes consumed in 2003 to 132,000 tonnes in 2015. However, the Brazilian exports are still stuck with around 40,000 tonnes a year. Local investments in juice factories and a high consumption of natural citrus make the possibility of stronger growth difficult for Brazilian companies. In 2012, there was also a slight decline of 1%. Aspects related to the supply of local products and international prices usually affect the Chinese demand for Brazilian juice.

The end result is that the group of countries known as Brics + Mexico increased their orange juice consumption by 64% in the period. However, the rest of the world fell 26%. The issue is that the consumer base in these emerging markets is really small compared to mature markets. In total, while the emerging markets added 112,000 tonnes, the main markets lost 579,000 tonnes – a deficit of only 467,000 tonnes in 2015.

If we consider the accumulated deficit year to year between 2004 and 2015, compared to 2003 consumption, the volume reaches 2.196 million tonnes, as shown in Figure 20. Taking into consideration the average crop yield estimated by CitrusBR of 291.8 boxes per tonne, we are talking about nothing less than 640.8 million orange boxes less in world consumption – which equates to about 60 million orange boxes less per year.

FIGURE 20: Orange juice consumption in 40 main markets, plus the deficit per year compared to 2003



Source: Markestrat from Tetra Pak Compass and FDOC

Per capita consumption

The segmentation of 40 main markets by per capita consumption – high (above five liters), medium (between one and five liters) and low (below one liter) – shows that the drop is stronger in the highest per capita consumption group. In this stratum, average consumption is going downhill, dropped down from 16.17 liters per capita in 2003 to 10.10 liters in 2015 – an equivalent reduction to 38%.

In the median consumer group, the drop is 13% – 2.54 to 2.22 liters per capita in the same period. In the bottom stratum, which brings together the lowest per capita consumption markets, such as China, the consumption increased by 123%, unlike the previous strata, from 0.14 liters per capita to 0.31 liters. However, as the base is small, this high growth represents a small volume of juice at 66°Brix, precisely. The increase is only 114,000 tonnes. Table 17 on page 88 shows the detailed data by market.

Beverage and flavor analysis

The good news is that the orange flavor remains on top in virtually all markets. The bad news is that the juice category decreased, which means that each year the citrus sector has a smaller share to distribute. However, in some markets, like Germany and Russia, cheaper apple juice is the leader, even by a small difference.

In Japan, a market that we bet a lot on in the past, the vegetable mix is leading. It's important to highlight that the fruit mixes are already the third-most sold product in important markets like the USA and Canada. From a strategic point of view, it makes a lot of sense for bottlers, who use a cheap fruit base and a mix of flavors, to literally dilute their risks.

The data for 2016 reveals, however, a new warning for Brazilian growers and the industry. When we look at the UK's data, we can see that the orange juice market shrunk about 187 million liters between 2003 and 2015, while coconut water increased 88 million liters in an explicit case of cannibalism.

It's known that coconut water is gaining market share, thanks to a narrative around rehydration with a low caloric percentage. In 2003, the UK consumed 740 million liters of orange juice and zero coconut water. In 2015, a decade later, orange juice consumption fell to 552 million liters and coconut water exploded to 88 million liters. In France, orange juice lost 8 million liters in the same period against the fruit mix flavor, which gained 76 million liters.

The fall in the American market

A look at the historical data series relating to the fall in the American market reveals a frightening phenomenon. Between the 1999/2000 and 2014/15 crops, there was a 45% fall. In other words, Americans consume practically half of the amount of orange juice they drank 16 years ago. Figure 21 is well-known in the studies we have presented over the years. Generally, when we analyze the data from the 2014/15 crop, we realize there was a 4% increase in price and an 11% loss in volume.

The recent data published by Nielsen, a consulting company that follows up retail sales data – specifically from the large supermarket chains, shows that

TABLE 17: Markets segmented by per capita consumption

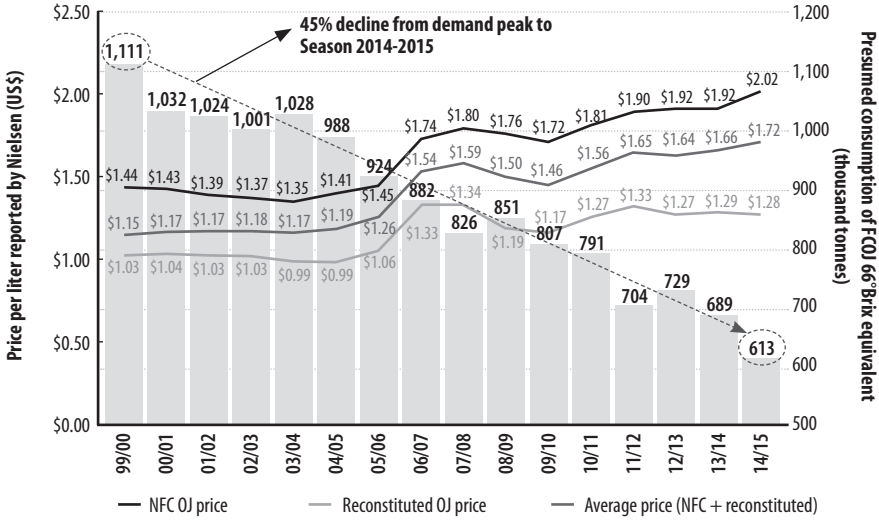
Markestrat value generation	Population as of Jan 1st	Per capita disposable income	Unemployment rate	Orange juice consumption per market			Per capita orange juice consumption per market			100% juice category development				
	Inhabitants '000	US$ per inhabitant	Percent	'000 tonnes of frozen concentrate orange juice 66°Brix equivalent			Liters per inhabitant as if all FCOJ was reconstituted to 100% juice at local minimum Brix			Orange share of stomach - %	Flavor of choice – 2015 Rank			
	2015	2015	2015	2003	2015	03 a 15	2003	2015	03 a 15	2015	#1	#2	#3	#4
High consumption														
1 Canada	35,898	$24,466	6.9%	116	112	-3%	19.55	16.68	-15%	51%	Orange	Apple	Fruit mix	Grape
2 Norway	5,167	$33,415	4,4%	12	16	33%	14.49	16.10	11%	65%	Orange	Apple	Grape	Other
3 France	64,216	$23,516	10,4%	152	141	-8%	14.27	11.71	-18%	49%	Orange	Fruit mix	Apple	Other
4 Australia	23,932	$33,653	6,1%	53	47	-12%	16.66	10.44	-37%	68%	Orange	Other	Apple	Mango
5 United States	321,607	$41,447	5,3%	1.001	613	-39%	18.41	10.17	-45%	54%	Orange	Apple	Fruit mix	Other
6 Germany	81,198	$25,497	4,6%	253	148	-42%	17.28	9.70	-44%	33%	Apple	Orange	Other	Fruit mix
7 Austria	8,554	$25,723	5,7%	19	15	-22%	13.50	9.51	-30%	41%	Orange	Apple	Multivitamin	Other
8 Sweden	9,731	$24,893	7,5%	26	17	-35%	16.54	9.39	-43%	42%	Orange	Fruit mix	Apple	Tropical
9 Belgium	11,292	$22,872	8,5%	22	19	-15%	12.09	8.98	-26%	47%	Orange	Fruit mix	Apple	Other
10 Denmark	5,660	$24,614	5,9%	12	9	-21%	12.33	8.81	-29%	41%	Orange	Apple	Fruit mix	Other
11 Switzerland	8,167	$50,515	4,5%	15	13	-11%	11.48	8.69	-24%	40%	Orange	Apple	Other	Multivitamin
12 United Kingdom	64,708	$27,719	5,3%	143	105	-27%	13.56	8.68	-36%	57%	Orange	Apple	Coconut	Pineapple
13 Netherlands	16,902	$21,091	6,9%	36	27	-25%	12.62	8.59	-32%	34%	Orange	Apple	Tropical	Fruit mix
14 Ireland	4,628	$21,017	8,0%	13	7	-43%	18.15	8.38	-54%	67%	Orange	Apple	Other	Fruit mix
15 Finland	5,474	$24,023	9,4%	16	8	-47%	17.33	8.28	-52%	58%	Orange	Apple	Fruit mix	Pineapple
16 New Zealand	4,551	$21,264	5,8%	7	6	-14%	10.36	6.70	-35%	38%	Orange	Other	Tropical	Fruits o/t forest
17 Saudi Arabia	31,540	$8,239	5,7%	15	36	146%	3.51	6.17	76%	58%	Orange	Mango	Apple	Apricot
18 Greece	10,974	$12,190	25,0%	12	11	-7%	5.94	5.29	-11%	39%	Orange	Fruit mix	Peach	Other
Total/weighted average	**714,198**	**$32.075**	**6.3%**	**1,923**	**1,351**	**-30%**	**16.17**	**10.10**	**-38%**					

	2015	2015	2015	2003	2015	03 a 15	2003	2015	03 a 15	2015	#1	#2	#3	#4
Medium consumption														
1 Chile	17,948	$8,821	6.2%	6	16	189%	1.88	4.83	157%	79%	Orange	Other	Pear	Apple
2 Spain	46,440	$15,634	22.1%	43	37	-13%	5.79	4.28	-26%	35%	Orange	Pineapple	Peach	Tropical
3 Poland	38,516	$7,212	7.5%	32	30	-7%	4.78	4.20	-12%	26%	Other	Orange	Apple	Tomato
4 Argentina	43,417	$8,792	7.2%	4	28	653%	0.53	3.47	559%	85%	Orange	Grapefruit	Apple	Peach
5 South Africa	54,491	$3,437	25.4%	20	29	49%	2.29	2.89	26%	59%	Orange	Other	Apple	Mango
6 Israel	8,360	$27,172	5.2%	5	4	-14%	4.36	2.85	-35%	71%	Orange	Apple	Trop./Seas.	Other
7 South Korea	50,617	$14,908	3.5%	45	23	-49%	4.99	2.43	-51%	55%	Orange	Grape	Apple	Other
8 Japan	126,808	$19,972	3.4%	92	52	-43%	3.83	2.19	-43%	21%	Mixed veg.	Other	Orange	Apple
9 Italy	60,843	$19,579	11.9%	33	25	-26%	3.27	2.17	-33%	32%	Orange	Pineapple	Tropical	Grapefruit
10 Russia	143,972	$5,029	5.6%	51	55	7%	1.98	2.03	2%	19%	Apple	Fruit mix	Orange	Tomato
11 Brazil	207,848	$5,827	7.1%	45	63	41%	1.34	1.63	21%	29%	Coconut	Orange	Other	–
12 Mexico	127,017	$6,605	4.4%	31	28	-11%	1.65	1.18	-28%	48%	Orange	Apple	Grape	Mango
13 Morroco	34,378	$2,055	9.8%	1	7	893%	0.12	1.07	762%	70%	Orange	Other	Apple	Grape
Total/weighted average	**960,654**	**$9,662**	**8,0%**	**407**	**399**	**-2%**	**2,54**	**2,22**	**-13%**					
Low consumption														
1 Romania	19,871	$5,064	6.8%	3	4	33%	0.70	0.98	39%	56%	Orange	Apple	Grapefruit	Tomato
2 Ukraine	44,934	$1,457	9.1%	6	7	19%	0.74	0.89	20%	13%	Other	Tropical	Tomato	Apple
3 Taiwan	23,434	$13,872	3.8%	7	4	-44%	1.55	0.83	-46%	19%	Fruit mix & veg	Orange	Other	Cranberry
4 Turkey	78,505	$6,504	9.8%	3	12	331%	0.23	0.79	246%	16%	Mixed	Apple	Orange	Pomegranate
5 China	1,367,820	$5,060	3.3%	46	132	189%	0.19	0.52	171%	47%	Orange	Apple	Fruit mix	Other
6 Colombia	48,229	$4,117	8.9%	4	4	6%	0.45	0.41	-9%	77%	Orange	Other	Grapefruit	–
7 Philippines	100,699	$2,188	6.1%	3	6	79%	0.22	0.31	45%	12%	Pineapple	Other	Orange	Grape
8 Indonesia	257,564	$2,004	6.0%	2	12	401%	0.06	0.26	316%	38%	Orange	Other	Apple	Grape
9 India	1,281,055	$1,481	5.1%	1	8	910%	0.00	0.03	743%	37%	Orange	Fruit mix	Other	Apple
Total/weighted average	**3,222,110**	**$3,338**	**4,7%**	**74**	**189**	**154%**	**0.14**	**0.31**	**123%**					

Source: Markestrat from Tetra Pak Compass and FDOC

sales continue to drop, even with lower prices observed on shelves. This means that the reason for this fast fall in consumption will have to be studied further.

FIGURE 21: The elasticity of the orange juice market in the United States



Orange juice average price elasticity

Price variation	1%	0%	1%	-1%	2%	6%	22%	3%	-6%	-3%	7%	6%	-1%	1%	4%
Volume variation	-7%	-1%	-2%	3%	-4%	-7%	-4%	-6%	3%	-5%	-2%	-11%	4%	-6%	-11%

Source: Markestrat from Tetra Pak Compass, FDOC and Nielsen

The power and the retail concentration

Every year we provide an analysis of the negotiation power of the large retail chains around the world, and each year, these giants' earnings can be compared to the GDP of many countries around the world. The five major chains in the world remain Walmart; Costco; Carrefour; Kroger and Lidl. Although some of these names are not familiar to Brazilians, the power of these companies is astonishing. This group made a combined US$979.7 billion in 2015. For comparison purposes, the GDP of Argentina in 2015 was 585.6 billion

dollars. The five major purchase organizations, gathering a series of retailers that gather in blocks to negotiate, add another 671.1 billion. This amounts to 1.65 trillion dollars. The Brazilian GDP was US$1.77 trillion in 2015.

When you observe the world retail concentration rhythm, you can see that it's a progressive movement that tends to increase. In order to analyze this, we considered the weight of the five major chains in several countries. Year after year, these giants' participation increased. In 2015, even the USA had 56% of its sales controlled by the top five. Germany, an important market to Brazil, has already broken through the barrier of 80%, concentrated among the top five. Japan sits on 77.2%; France on 74.8%; and so on.

The same effect has been observed with bottling companies and Brazilian juice buyers. These are real monsters, created by companies that merge with other companies, which are the result of previous mergers. They make this market even more difficult for those who want to sail in it.

The problem of production

The USA will have an estimated crop of 60 million boxes of 40.8kg each in 2016. This corresponds to a production of 260,000 tonnes of juice and an estimated consumption of at least 550,000 tonnes. This will result in a gap of 290,000 tonnes – a number aligned with imports from the past few years.

Brazil, however, is facing one of the lowest juice production yield in its history, as a result of two small crops and two really bad years of industrial yield. It seems that the juice supply for the 2016/17 crop will be the same as the demand.

If Brazil can't meet the American demand, Mexico and Central America countries could benefit if they can offer sufficient production. The worst case scenario, however, would be a constraint in supply, which would make orange juice even more difficult to consume, "forcing" consumers to replace it with other drinks.

Conclusion

The challenges in the orange juice market remain serious. Even though the situation in the sector has substantially improved since 2013, due to a tightening in fruit supply from weather-affected crops, we have not yet won the day.

On the one hand, it's good that the grower has an income again after years of crisis. On the other, it's not the time to let our guard down. CitrusBR is working on an orange juice repositioning campaign. More information can be found at www.fruitjuicematters.eu.

It's time for the chain to gather and to work to ensure that the orange juice business recovers its former prestige. So, if it's possible to put out an optimistic message, let us reiterate that the citrus chain has in its hands an excellent product. Orange still offers top quality, benefits and flavor.

7

A CHALLENGING YEAR FOR THE FCOJ SUPPLY CHAIN[8]

Orange juice has a very complicated supply chain that we have addressed with *Fruit Processing* readers for almost 20 years. But 2017 seems to be even more complicated as a result of the very low stock levels and a high dependence on the Brazilian crop coming from the Brazilian 2017/18 season. Before coming back to this issue, let's address some issues that affect supply and demand.

Orange juice supply chain issues

The commercial production is mostly concentrated in São Paulo and Florida (without disrespecting the production coming from several other countries). About 10 years ago, these two areas of the world were able to produce 640 million boxes of oranges (40.8kg). Now, the production averages about 244 million boxes in Brazil and 70 million in Florida, totalling 314 million boxes. This is half of the peak production levels once achieved. Now imagine, as an example, having a chain structure that is designed to operate with 100 only operating with 50: widespread idle capacity, underused tangible and intangible assets, and increasing costs and inefficiencies in the supply chain.

Steep increases in production costs have also occurred over the past 10 years. Yields have also declined as a result of disease. Besides increasing farming costs, we need many more boxes to produce a tonne of orange juice than was needed 10 years ago. Oranges in Brazil currently contain a large amount of

8 Marcos Fava Neves, Vinicius Gustavo Trombin. *Fruit Processing* (March 2017).

water, with almost 290 boxes needed to produce a tonne of orange juice. A few years ago, it only took 250 boxes. This issue indicates a 40-box cost increase per tonne of FCOJ.

A study released by specialists in Florida (2016) reveals three scenarios for orange production in 2026/27. In Florida, it will vary from 77–88 million boxes, and in São Paulo, around 235 million boxes. So, on the supply side, we may not expect a different situation from the one faced today. Farmers are afraid of what can happen, and even with good prices received in 2016/17 season, we don't foresee investments returning.

Demand issues

Over the past 10 years, juice consumption declined almost 20% (from 2,397 million tonnes in 2005 to 1,938 in 2015). Let's remember that at the same time the world's population increased 12%, and per capita income increased 39%.

US consumption data at the beginning of 2017 showed an 8% decrease compared to the last period. That is sad news for the industry. Considering the strength of the US market, 8% is huge.

The situation for 2017

A quick look at Brazilian juice exports shows a volume 2% higher than in the same period of 2015, with around 992,000 tonnes, valued atUS$1.63 billion. Shipping showed growth of around 11%, mostly to Japan, China and South Korea, and also to the European market (the largest buyer of Brazilian juice with a growth of 1%, importing almost 651,000 tonnes). The USA imported 4% less from Brazil (188,000 tonnes) in 2016.

Since the decline in demand is much smaller than the current decline in supply, we face a situation in which global consumption is bigger than production, and the stocks of FCOJ are declining fast. In an announcement, the Brazilian juice industry association (CitrusBR) announced the level of stocks held by the Brazilian companies as at December 31 2016 to be 497

tonnes in their facilities (around 32% less than the amount held in 2015). CitrusBR's prediction for June 30 2017 was that Brazil would only have 70,000 tonnes – an amount 80% less than in June 2016.

Scarcity of supply immediately provides a price reaction. Part of these cost increases could be absorbed by bottlers and retailers, but the remainder of the supply-cost increase has to be transferred to the final consumers. We don't yet know how consumers may react to this price increase as the major competitor of orange juice, apple juice, has ample supplies available.

Global demand for exported juice is approximately 90,000 to 100,000 tonnes per month, so the stocks will be enough for only three weeks. Any issue that the weather cause with the Brazilian crop will place stress on the market, owing to smaller stocks and the huge dependence of this business on a very good crop. Consequently, the Brazilian 2017–18 crop was under massive pressure. This was to be announced by Fundecitrus on May 10 2017.

8

THE INFORMATION REVOLUTION IN THE JUICE BUSINESS[9]

When reviewing the history of our fruit and juice industry, there are several important changes that can be considered revolutions. These changes are linked to processing; machinery; technology; products; credit; co-operatives; labor; water; irrigation; genetics; and the environment. Each one substantially impacts on the fruit processing industry and the juice chain.

One of these changes, which is creating a current challenge to our business, is data. New technologies allow for the generation of data in almost all instances from different sources. If we have the capacity to transform this data into good information, several opportunities will emerge, creating wins in the food and juice business. It is a race for the future of data generation and the use of information. No juice company can ignore this process.

In this article, the data revolution in the food and juice industry has been separated into three parts: The sources of data; the processing of data into information; and the use of information.

The sources of data

Comparing our lives and decisions now to 10 years ago, we can easily perceive new sources of data registers based on a much greater use of technology. Data that can be used in food and juice industries is constantly being generated in the following areas:

— The consumption of juices, beverages and other products.

9 Marcos Fava Neves, Vinicius Gustavo Trombin. *Fruit Processing* (April 2017).

— Financial transactions; credits; assets; and liabilities in banks and other financial institutions.
— Product and service purchase transactions.
— Credit and debit cards usage and personal data.
— Traffic of cars, tractors, combines and others; tolls and GPS information.
— Interpersonal co-operation (as an example, Waze and other applications/systems).
— Millions of sensors (speed, temperature, traffic, weight, size).
— Hashtags, tweets and other movements.
— Images and videos (uploads and downloads).
— Website page views, comments, likes, dislikes and others.
— Mobile phone traffic and usage.
— Tracing information (traceability) from the supply chain (barcodes).
— QR codes access.
— Physical and virtual memberships, communities and clubs.
— TVs, computers and other devices tracking information.
— Insurances and other services (health, home and cargo).
— Drones, satellites images and others.
— Weather, rain and varying temperatures.

These are just some examples of sources of billions of pieces of data currently being generated. Much of this wasn't available a few years ago. So, if you have access to data, you are one step ahead.

The processing of data into information

The second topic is the capacity of an organization (in our case, the juice industry) to filter, elect, process, aggregate and analyze, transforming billions of pieces of data from very different sources into relevant information for the structuring of the decision-making process. How to do this is the big question. This involves forming an interdisciplinary team of specialists working in systems, strategy and data mining. It is a challenge of organization!

The use of information

Finally, we come to the third topic, which brings the opportunity to use all of this data, transformed into information for an organization (juice industry). Several opportunities will allow improvements that can be captured to create a competitive advantage:

— More efficiency in targeting marketing efforts, for new product and new service developments and communications.
— Increased controls in production processes and, as a consequence, productivity. These controls will allow for the anticipation of, and better diagnosis of, bottlenecks.
— Economy of resources (supply, fruits, fertilizers, chemicals, seeds and others) via a more precise supply chain. We can even think about a "zero waste" supply chain working all the way through agriculture.
— More information, allowing for improvements in interfirm co-operation and links and improvements in all types of projections.
— Anticipation of macro-environmental impacts, with better signaling.
— More controls allowing for efficient just-in-time operations, with less stock and better management of inventory.
— Accelerated learning, reducing costs for the juice industry.
— The more efficient use of machinery.
— An improved capacity for price monitoring and dealing with volatility in futures markets.
— More efficient buying of resources needed for the production in the juice industry.
— More information leads to better decisions.

The challenges for the juice industry and other food organizations are included in three parts in this section:

1. How do we build access to data?
2. How do we filter and process data into relevant information?
3. How do we use this information to spur on the continuous search for a competitive advantage?

Take a look at the mobile phone beside you. Imagine how it looked 10 years ago and how many industries it substituted. It now allows you to perform several activities with just one device. What does the future hold, with this information now readily available for food and juice industry decision-makers? We face another revolution. Be prepared!

9

WHERE TO EXPECT FOOD AND JUICE MARKETS GROWTH IN THE WORLD[10]

Looking at our future possibilities for food and juice consumption, this article is an exercise in the global evaluation of which countries are showing the biggest opportunities in terms of growth for food and juice commodities, value-added products when income growth is present, and the major characteristics these markets share.

The objective is to contribute to a model to understand the variables that help to build marketing intelligence systems.

Before examining the common characteristics, let's take a look at some interesting numbers around emerging economies that give flavor to our model. Indonesia has about 252 million inhabitants. KFC opened the first outlet in the country in 1979, and in 2013 they had about 470 restaurants. In 2011, Indonesia had 5,900 fast food restaurants, and in 2017 they expected that to grow to 9,000 units. Nigeria has 175 million inhabitants. KFC opened their first restaurant there in 2009 and had about 25 units after three years. The Nigerian fast food industry is growing at more than 10% per year.

McDonalds started in China in 1990, and now has 2,000 restaurants. It is the third largest fast food market, with US$2.8 billion in sales in 2013. Vietnam has almost 100 million inhabitants. The fast food market is growing by 26% per year, and the number of restaurants has tripled in five years. KFC opened their first outlet there in 2011 and now has 140 restaurants offering

10 Marcos Fava Neves, Vinicius Gustavo Trombin. *Fruit Processing* (May 2017).

4,000 jobs. McDonalds opened the first restaurant in 2014 and had 20,000 customers in the first two days. Pakistan has almost 200 million inhabitants. It is a market of US$1 billion per year and grows by 20% each year.

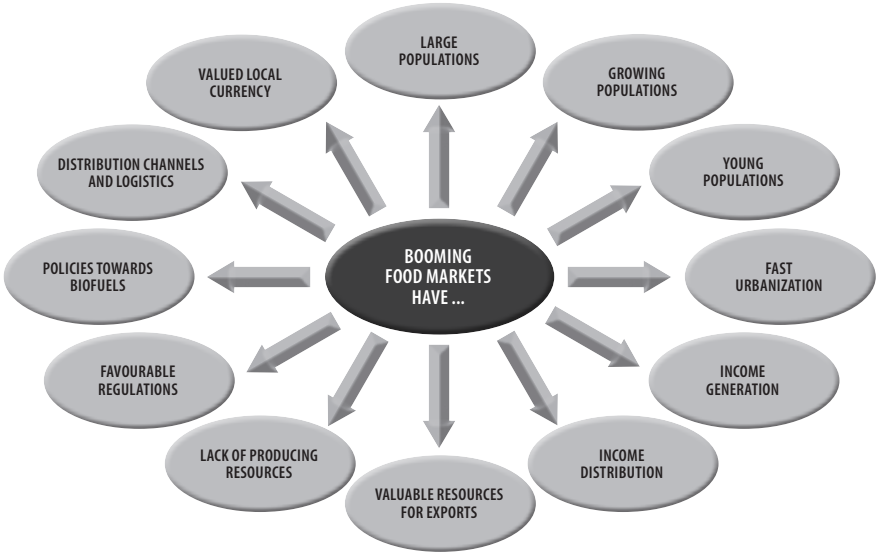
These booming numbers happened because these companies conquered the consumers by providing more reliable food supply chains and an awareness of health issues. We also see a westernization of younger generations and a wider use of mobile devices.

To predict which countries will offer the most attractive opportunities for our food and juice companies, let's consider some characteristics they may have in common.

The following 12 factors must be observed in order to identify booming food markets in the coming years. Such countries have:

1. Large populations (in amount of inhabitants).
2. Growing populations (rate of growth of the population).
3. Young populations (propensity for growth).
4. Fast urbanization (high percentage of people still in rural areas and moving to cities).
5. Income generation (GDP growth).
6. Income distribution (growing middle class).
7. Resources of value that are being exported (oil/gas/minerals), generating capacity to pay for food imports.
8. A lack of producing resources (low land availability; low water availability; lack of other resources and a capacity to invest and receive foreign direct investments in food and juice production).
9. Regulations that favor food and juice imports (openness to imports, low trade barriers like import taxes; quotas, sanitary barriers and lower sensitivity, bringing smaller efforts towards food security/local production), and stability of governments/ institutional environment.
10. An adoptions of policies that are working towards the blending biofuels with petrol.
11. An availability of import distribution channels and feasible logistics, which make it attractive for international retailers, using global sourcing strategies, to bring food and juices to these countries.
12. Exchange rates that favor food and juice imports (valued local currency).

FIGURE 22: An outline of the qualities of booming food markets



The next table provides a deeper analysis of all the factors, as well as the indicators and sources where we can find information to build our intelligence systems.

TABLE 18: Factors and indicators in booming markets in need of analysis

Factors	Indicators	Source
Large populations	Number of inhabitants	United Nations
Growing populations	Average of percentage of population growth in the last four years	United Nations
Young populations	Percentage of inhabitants up to 14 years of age in 2016	United Nations
	Average growth in the last four years	United Nations
Fast urbanization	2016 urban percentage	World Bank
	Average growth in the last four years	United Nations
Income generation	2016 annual GDP	United Nations
	Average growth in the last four years	United Nations

Factors	Indicators	Source
Income distribution	Gini index	World Bank
Valued resources	2016 exports of goods and services	World Bank
	Average growth in the last four years	World Bank
Lack of producing resources	Arable land (2016 and four year's growth)	World Bank
	Water availability	World Bank
	Foreign investments	World Bank
Regulations that favor food and juice imports	Food import taxes	World Economic Forum – Global Competitiveness Report
	Trade barriers	World Economic Forum – Global Competitiveness Report
	Stability of governments and institutional environment	World Economic Forum – Global Competitiveness Report
Adoptions of policies towards blending biofuels with petrol (mostly for food)	Percentage of biofuels mixed with petrol fuel	Global Renewable Fuels Alliance
Import distribution channels and feasible logistics	Goods market efficiency	World Economic Forum – Global Competitiveness Report
	Transportation infrastructure	World Economic Forum – Global Competitiveness Report
Valued local currency	Exchange rates of the last four years (dollar)	World Bank

So, how do we use this framework? When preparing and analyzing the markets, each of these 12 factors can receive a score from 0 to 10 for their establishment in each of these areas. The final score serves to identify which countries in the world are showing the greatest opportunities for growth in the food and juices industry, and to analyze which key features these large markets have in common.

We can still expect some big surprises in these country, since these environments normally still contain many street markets. The informality of these food chains means that some data is not available. We may suddenly see a country beginning to import a lot, which was not predicted. However, these are must-have characteristics of markets for global consumer goods companies in the coming years, providing opportunities for food exporting countries.

10

THE BRAZILIAN 2017/18 ORANGE CROP AND JUICE PRODUCTION[11]

The 2017–2018 orange production forecast was published on May 10 2017 by Fundecitrus, with the co-operation of Markestrat, FEA-RP/USP and FCAV/Unesp. This forecast was 364.47 million boxes (40.8kg: 68.49 million boxes of the Hamlin, Westin and Rubi varieties; 17.42 million boxes of the Valencia Americana, Valencia Argentina, Seleta and Pineapple varieties; 114.52 million boxes of the Pera Rio variety; 123.04 million boxes of the Valencia and Valencia Folha Murcha varieties, and 41.00 million boxes of the Natal variety.

The bearing trees of the varieties that made up this forecast total 174.78 million. The information about bearing trees was extracted from the *Tree Inventory of the São Paulo and West-south-west Minas Gerais Citrus Belt: Snapshot of Groves in March/2017*. This was updated by the field assessment carried out from January 30 to March 10 2017.

The average number of fruit per tree in April 2017, not considering the droppage that occurred during the season, was measured at 753 fruits per tree. The bloom issuance and fruit setting rate for the 2017/2018 season, between August and December 2016, benefited from the low yield of the previous harvest, which provided a dormant period in the reproductive cycle. This resulted in increased energy reserves in the trees of the general citrus belt. Weather conditions observed in this period also contributed to the increased yield. In July, water and heat stresses caused by cold nights (average of 12°C

11 Marcos Fava Neves, Vinicius Gustavo Trombin. *Fruit Processing* (June 2017).

TABLE 19: Orange production forecast for 2017–2018 season, and its components by variety group

Variety group	Mature groves area	Average density planting[1]	Components of May/2017 forecast				Orange production forecast 2017–2018		
			Bearing trees	Fruit per tree at stripping[2]	Fruit forecasted by box	Fruit loss from droppage forecast	2017–2018	By area	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(number)	(number)	(%)	boxes/tree	boxes/hectare	(1,000,000 boxes)
Early season:									
Hamlin, Westin, Rubi	62,746	452	27,308	972	310	11.00	2.51	1,092	68.49
Other early season:									
Valencia Americana, Valencia Argentine, Seleta, Pineapple	17,883	456	7,950	714	257	12.30	2.19	974	17.42
Mid-season:									
Pera, Rio	125,367	495	60,235	666	260	17.50	1.90	913	114.52
Late season:									
Valencia and V. Folha, Murcha[3], Natal	137,416	457	61,181	729	250	23.30	2.01	895	123.04
Average:	(X)	467	(X)	753	265	18.50	2.09	945	(X)
Total	**385,525**	**(X)**	**174,779**	**(X)**	**(X)**	**(X)**	**(X)**	**(X)**	**364.47**

(X) Not applicable
1 The calculation considers the total number of trees of the block, that is, bearing and non-bearing trees (2015 or 2016 resets).
2 Weighted average per stratum fruits.
3 V. Folha Murcha – Valencia Folha Murcha

in the citrus belt), followed by warm, dry days (average of 27.3°C) favored floral induction. The first rains arrived in August 2016, except in the Triângulo Mineiro, Altinópolis and Matão regions, which began their regular rainfall in October.

TABLE 20: Orange production forecast for 2017 season by sector

Sector	Mature groves area	Average density planting[1] of mature groves	Bearing trees	Fruits per tree at stripping[2]	Orange production forecast 2017–2018		
					By tree	By area	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(number)	(boxes/tree)	(boxes/ hectare)	(1,000,000 boxes)
North	85,871	472	39,290	801	2.20	1,007	86.49
Northwest	40,584	439	17,635	673	1.88	818	33.19
Central	109,271	466	49,133	723	2.01	903	98.64
South	78,469	450	34,216	748	2.07	903	70.83
Southwest	71,330	496	34,505	788	2.18	1,056	75.32
Total	**385,525**	**467**	**174,779**	**753**	**2.09**	**945**	**364.47**

1 The calculation considers the total number of trees of the block, that is, bearing and non-bearing trees (2015 or 2016 resets).
2 Weighted average per stratum fruits.

2,200 trees were stripped, proportionally distributed to the total number in the citrus belt, and stratified according to region, variety, and age. In order to increase the accuracy of the forecast, an additional 360 trees younger than the age bracket of the groves to which they belonged were stripped. Such trees correspond to resets mainly from offset trees lost due to HLB (huanglongbing, or greening), citrus canker and other diseases. Such stripping was carried out between March 17 and April 27, 2017.

The average number of fruit per tree varied by 14 fruit more or less. This corresponds to 1.9% of the average number of fruit per tree obtained by stripping. Such a figure is in accordance with the expected error of 2–3% used in sample sizing. The analysis of the yield deviation distribution of each

TABLE 21: Orange production forecasts for the 2017–2018 season by tree age group (continues)

Age of blocks	Mature groves area	Average density planting[1] of mature groves	Bearing trees by group age				Fruits per tree at stripping by age group of trees[2]			
			3–5 years	6–10 years	Over 10 years	Total	3–5 years	6–10 years	Over 10 years	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(1,000 trees)	(1,000 trees)	(1,000 trees)	(fruit tree)	(fruit tree)	(fruit tree)	(fruit tree)
3–5 years	48,447	603	28,214	–	–	28,214	400	–	–	400
6–10 years	141,481	516	3,137	4,036	57.685	70,822	150	718	–	693
Over 10 years	195,597	397	3,003	4,036	4,036	75,744	159	328	1,012	941
Total	**385,525**	**467**	**34,354**	**71,721**	**68,705**	**174,779**	**356**	**696**	**1,012**	**753**

1 The calculation considers the total number of trees of the block, that is, bearing and non-bearing trees (2015 or 2016 resets).
2 Weighted average per total stratum fruit.

TABLE 21.1: Orange production forecast for the 2017–2018 season by tree age group (continued)

Age of blocks	Orange production forecast for the 2017–2018 season by tree age group				Orange production forecast for the 2017–2018 season by tree age group			
	3–5 years	6–10 years	Over 10 years	Total	3–5 years	6–10 years	Over 10 years	Total
	(boxes/tree)	(boxes/tree)	(boxes/tree)	(boxes/tree)	(1,000,000 boxes)	(1,000,000 boxes)	(1,000,000 boxes)	(1,000,000 boxes)
3–5 years	1.12	–	–	1.12	31.59	–	–	31.59
6–10 years	0.42	1.99	–	1.92	1.31	134.89	–	136.20
Over 10 years	0.43	0.91	2.79	2.60	1.30	3.66	191.72	196.68
Total	**1.00**	**1.93**	**2.79**	**2.09**	**34.20**	**138.55**	**191.72**	**364.47**

stripped tree in relation to the stratum average shows that the sample data is randomly distributed according to a normal distribution.

The average size is estimated at 265 fruits per box of 40.8kg. Smaller fruit are expected for this season owing to the greater quantity of oranges on the trees, which limits their growth potential. In addition, according to Somar Meteorologia, the expectation for the second half of 2017 is for a milder El Niño, unlike what happened in 2015, when there were heavy rains above the historical average, resulting in an increased fruit weight. The average droppage rate is estimated at 18.5%. The forecast rate is greater than assessments for previous seasons. This is related to a greater production volume expected for this season. This might cause an extended harvesting period, thus increasing fruit exposure to pests and diseases, with the potential to cause fruit droppage.

TABLE 22: Orange production forecast for the 2017–2018 season by bloom

Bloom	Orange production forecast 2017–2018	Percentage of orange production forecast by bloom
	(1,000,000 boxes)	(percentage)
First	265.24	72.77
Second	65.77	18.05
Third	29.55	8.11
Fourth	3.91	1.07
Total	**364.47**	**100.00**

To carry out this forecast, we maintained the objective method used in the last season, based on quantitative data: Field measurements and the counting and weighing of fruit, applied in the direct expansion model. The result of this equation needs to be corrected according to variables not considered in the model. These include the different planting densities of blocks that are not included in the stratification of groves, or the loss of trees along with the harvest caused by eradications, abandonment or deaths. The correction factor (CF) represents the average of the indicators used in the 2015–2016 and 2016–2017 seasons.

Table 19 on page 105 shows the orange production forecast and its components by variety group.

This executive summary was approved on May 10 2017. The full report of the tree inventory and the orange production forecast for the 2017–2018 season of the São Paulo and west-southwest of Minas Gerais citrus belt forecast is available at www.fundecitrus.com.br.

The tables presented show the orange forecast for 2017–2018 by sector, age, bloom and variety. The margin of error in the production forecast by strata is greater than that of the production forecast for the citrus belt as a whole. Variations that may occur in fruit size and droppage rates could alter the forecast, and these will be calculated throughout the season by constant monitoring in the field.

As a final comment, the crop is bigger than the last four seasons, and around 14% higher than the last 10 years' average. This will help with the accumulation of stocks again, but these stocks will still be low compared to those of the past 10 years. Brazil needs at least two more crops like this in order to ensure comfortable stock levels.

11

A COLLECTION OF 20 MESSAGES ABOUT FOOD AND JUICES MARKETING

In this article, the idea is to raise 20 issues and trends that are currently being discussed by food and agribusiness researchers and executives. This is based on our readings and participation in conferences.

1. Food markets continue to grow, and consumption patterns are changing fast, impacting global trade. This is not only happening in Asian countries, but in African and Middle Eastern countries, too.
2. The volume of exports and imports of food and agribusiness show the increasing relevance of the USA in global food trade.
3. The so-called farm-to-market, or direct selling channels from farmers to consumers (DTC), are growing. These present an important opportunity for value creation for farmers as individual or farmers' organizations.
4. Food that is produced locally ("local foods") is gaining value with consumers. This represents an opportunity for differentiation; using origins, labels, stamps and identification at retail level. Be aware of the "buy local" movement to capture opportunities, and the trend of knowing your farmer (where my food was produced, and by whom). This builds links from the urban consumer to rural life.
5. The issue of putting together large volumes of data into relevant information for farmers will represent an ocean of investments and opportunities in food production chains.
6. The new agriculture pattern will require so-called "smart farming", which applies several technologies in order to produce more food with less resources, thus resulting in maximum profits via efficiency gains.

7. The merging of some markets (food, pharmacy, cosmetics and medicine) is requiring a convergence of food industries and an increasing need for innovation in order to continue competing in the marketplace. This enhances the focus on big food companies.
8. The gaps are increasing between companies, individuals, economies and strategies that try to include and enhance smallholders' participation in food chains. This will receive much more attention.
9. The growing food business will require many talents (people). These resources will become more challenging for companies in the food chain.
10. There is a growing importance of the label as a source of information, transparency and science, as a result of higher consumer awareness in the digital world. The much more connected and new social generation wants to know the story behind the brand, and the meaning and engagement of the company. The web can be used to gather more information about the offering; inviting the consumer to follow up on knowledge acquisition. This will require an increase in consumer education efforts on the label and, in some cases, even an anticipation of future regulations in the industry, while taking care to avoid excessive information.
11. Growing consumer interest in food cooking, and knowledge about gourmet kitchens, utensils, home cooking and special meals is driving food companies and retailers to offer more information about how to cook, as well as product lines linked to freshness, diversity, health, fun and "social activity.
12. There are increasing opportunities to have clear and transparent projects with consumer influencers, like university, associations, scientists and others – and to advertise these in the company offering.
13. In new product developments, there are opportunities for snacking concepts that cover nutrition, convenience and portability, with different needs based on the time of day that the product will be consumed (food on-the-go).
14. Communicating clearly the math, the amount of calories and fat content consumed during the day is now accepted. Consumers now eat because they know they deserve it and can burn off the calories. It is important to have responsible communication, not only for children (a vulnerable audience) but for all consumers.

15. The growing urban world faces a protein boom, and we are looking to other sources of protein beyond traditional ones, like milk and meat. We may expect several innovative solutions in the near future.
16. New uses for fruits and vegetables as snacks, and as natural coloring for foodstuffs and as flavoring, are being explored.
17. An increase in the incidences of frozen foods using the argument of nutrition (superior nutritional content). Even frozen products can deliver several nutritional benefits.
18. Private labels (supermarket brands) gained market share during the crisis of the past decade. When consumers grew used to them, they perceived the value behind a possible lower price for almost the same product, or even the same.
19. There is an increasing focus on acquiring knowledge of consumers, and product customization based on this knowledge. This helps insight generation methods for creating new offerings in tune with consumers' needs. Much research is being conducted to improve the consumer experience and taste perceptions. This even includes changing the texture of some foods and beverages.
20. There are a growing number of opportunities for creating consumer clubs and/or groups (digital platforms) to bring a sense of belonging to the consumer and a permanent link with the company, almost as recognition.

We hope that these 20 topics provide some insights into future marketing activities.

12

STRATEGIC PLAN FOR THE BRAZILIAN AGRO-INDUSTRIAL CITRUS SYSTEM

12.1 Introduction

The macro-environment in which organizations are inserted has become increasingly competitive and globalized. Changes are happening at an accelerated speed in an environment full of innovation, new products and increased competition. This requires great dexterity, flexibility and planning from organizations, who need to highlight and adapt to these changes.

Heleno (2009), believes in Brazil there is an absence in the application of management science, especially in agribusiness – more specifically, in rural production. This results in many losses for national agribusiness.

The systemic approach has been an important theme in management studies, where the importance of understanding the environment in which an organization operates is highlighted. When it comes to the agribusiness context, this analysis is converted into studies of agro-industrial systems (AiS), networks, supply chains, inter-organizational relationships and NetChains (Conejero, 2011).

In recent decades, there have been major breakthroughs in research, methods, and issues relating to strategic management in companies. According to Neves (2004), the strategic management of supply chains has become crucial for the implementation, development and sustainability of production chains – a fact occasioned by the advent of globalization. This has led to a growing need to produce food more efficiently, as well as the formation of transnational

production chains (Neves, 2004). King et al. (2010) states that understanding and anticipating the dynamics of the global agribusiness environment will be increasingly critical. Neves (2008) complements this by stating that strategic planning is essential to address the changes in the business environment for companies, and also increases opportunities for agro-industrial systems.

Brazilian citriculture has approximately 12,000 orange producers spread over 800,000 hectares, cultivating 165 million trees (IBGE, 2006; 2010). In 2009, the GDP of the citrus sector was US$6.5 billion, and gross sales of the production chain were US$14.6 billion. Additionally, citriculture in 2009 raised approximately US$190 million in taxes for the Brazilian state (Neves et al., 2010).

Citriculture generates about 230,000 direct and indirect jobs for the country, thus moving a payroll of R$676 million (Neves et al., 2010). Furthermore, the Brazilian production of orange juice represents 53% of world production, and 98% of what is produced in the country is exported. This gives Brazil 79% of the world market share. For every five glasses of orange juice consumed in the world, three were produced in Brazil (Neves et al., 2012a).

Neves et al. (2012b) briefly discusses some of the major events experienced by Brazilian citriculture in the past decade. Among these events, the authors cite:

1. A drastic drop in orange juice consumption in the United States, Germany, Japan and other traditional markets.
2. A small-scale increase in the consumption of orange juice in emerging countries.
3. A large increase in the number of innovative beverages launched.A retail concentration in large companies or purchasing centers.Bottling companies, which dominate the link in packaging and retail distribution, are now multinational beverage companies.
4. Due to a lack of positioning, strategic vision and a harmonious understanding between links in the Brazilian chain, orange juice is sold at the same price as water to the end consumer in Europe.
5. A large increase in agricultural and industrial costs.

This research has been justified by the economic and social importance of the citrus chain for Brazil: The promotion of income for farmers; the generation of thousands of direct and indirect jobs; tax collection; and collaboration for the growth of the economy of the country.

These are just some of the benefits of a well-established and structured chain. In addition to the economic and social importance of the citrus industry, another factor that justifies the importance of this research is the low management application within agribusiness and the citrus agro-industrial system.

This research seeks to fill the academic gap in a strategic planning method by applying it to the Brazilian citrus sector. Therefore, the central question this study aims to answer is: What are the main strategic projects necessary to strengthen the Brazilian citrus sector and to mitigate the negative effects experienced in both national and international scenarios?

The overall objective that governs this article is to present a strategic plan for the Brazilian agro-industrial citrus system, developed from the application of the method of Strategic Planning and Management of Agro-industrial Systems (SPMAS), and to propose strategic projects to mitigate the problems faced by the agro-industrial system while strengthening the sector.

12.2 Theoretical reference

Approaches to agro-industrial systems, supply chains and networks

Two traditional and pioneering approaches to the concept of agro-industrial systems are found in literature: The approach developed by Goldberg (1968) and the proposal from Morvan (1985). Goldberg (1968) developed the theory of the Commodity System Approach (CSA) in the USA. This was done in studies of the productive systems of citrus, wheat and soybeans. The term CSA points to a commodity system that addresses all actors involved in the production, processing and distribution of a product, while emphasizing the sequence of product changes in the system. The author's merit lies in changing

the focus of the analysis that had once been restricted only to production within the farm. He then started to look at the system as a whole, and at the agricultural sector from the global economy, rather than considering the sector in isolation.

Another traditional approach to agro-industrial systems was proposed by Morvan (1985) in France, which defines a chain (*filière*) as a set of related operations to transform a product. The author also states that analysis of *filière* is an important tool to describe systems; organize the integration of research; and analyze industrial policies, companies and collective strategies.

Batalha (2001) adds to this by stating that the chain has a complementary interdependence and is influenced by technology.

Zylbersztajn (2000) states that an agro-industrial system can be defined as a succession of operations of vertically organized production activities: From production to the final consumer (Figure 23), covering the following key elements: Agents; sectors; their relationship; the institutional environment; and support organizations.

The organizational environment: Associations, information, research, finance, co-operatives and firms.

The Institutional environment: Culture; traditions; education; customs; laws and regulations.

FIGURE 23: The agribusiness system and typical transactions

Source: Zylbersztajn (2000)

For Batalha (2001), a production chain consists of sequencing activity that turns a commodity into a product for the consumer. Its representation is made in the form of a chain of necessary operations (technical, logistical and commercial) involving the production of raw materials into the final consumption of the product.

Monteiro et al. (2013) states that governance relations in agribusiness have become more complex. The authors also states that the adoption of a systems approach to agribusiness requires knowledge of the internal dynamics of each agricultural sector, in conjunction with the knowledge of the business environment, and a knowledge of organizational and institutional environments, too.

For Neves (2004), the biggest challenge of supply chains is that there are often conflicting interests between the agents that compose it. However, always in need of improvement in Brazilian production chains are the coordinated marketing efforts in strategic plans involving all links and agents of the chain, along with collective actions that seek greater integration between the public and private sector.

Planning and strategic management methods

The concept of strategic planning is seen more basically in Chiavenato (1979, p. 391): "Strategic planning is related to the general concept of the firm in the future, and forecasts and distributions of total resources to the opportunities offered by the market and by the products, in order to realize the company's profit potential through the chosen strategies."

Lambin (2012) emphasizes that for the success of the organization, it is necessary for strategic management and strategic planning to organize all systematic information.

Some authors are found to go beyond the strategic settings, management and planning, to proposed methods for the preparation of strategic planning. These authors include Campomar (1982); Westwood (1995); Las Casas (1999); Kotler (2000); Jain (2000); Wright; Kroll and Parnell (2000); Lambin (2000); Wood (2004); and Neves (2004).

Despite such diversity, Oliveira (2006) states that none of the methodologies can be considered wrong, only more or less appropriate to the current moment experienced by companies and the markets in which they operate. In this point of the study, some of the key strategic planning methods in the literature are analyzed.

TABLE 23: A study of the stages of strategic planning methods

Author/ common steps	Lambin (2000)	Hooley, Saunders e Piercy (2001)	Hall e Lyford (2002)	Pearce e Robinson (2005)	Oliveira (2006)	Neves (2008)	Silva e Batalha (2010)	Soriano, Torres, Rosaleñ (2010)
1	Vision statement	Define the purpose or business mission	Initiation of the process	Mission and social responsibility	Strategic diagnosis	Introduction and understanding	Awareness	Planning project
2	External analysis	Internal analysis	Situational analysis	External environment	Business mission	Market and consumer analysis in the systems approach	Mission definition	Definition of business mission
3	Internal analysis	Sectorial analysis	Vision determination	Internal analysis	Prescriptive and quantitative tools	Analysis of the internal situation and global competitors	Definition of the general objectives	Stakeholder analysis
4	Analyses and strategic choices	Definition of central strategy	Positioning of growth	Analysis and strategy choices	Control and evaluation	Objectives for the system	Diagnostic strategy	Strategy definition
5	Definition of marketing projects	Creation of competitive positioning	Principle industry improvement goals	Long-term objectives		Strategies to achieve the proposed goals	Strategic segmentation	Definition of the strategic implementation plan
6	Marketing budget	Implementation	Specific strategies	General strategies		Production, product, research and development projects	Segment objectives	Determination of indicators and goals
7	Contingency plans	Organization	Implementation and co-ordination of strategies	Short-term objectives		Communication projects	Identification of strategic options	Validation
8		Control	Strategy review and reassessment	Functional tactics		Distribution and logistical projects	Action plans	Monitoring

Author/ common steps	Lambin (2000)	Hooley, Saunders e Piercy (2001)	Hall e Lyford (2002)	Pearce e Robinson (2005)	Oliveira (2006)	Neves (2008)	Silva e Batalha (2010)	Soriano, Torres, Rosaleñ (2010)
9				Policies		Training projects in the agro-industrial system/ human resources	Implementation	
10				Organizational restructure		Co-ordination and adaptation to the institutional environment project	Control	
11				Control and continuous improvement		Consolidation of strategic plans		
12						Budget		

Source: Elaborated by the authors based Lambin (2000), Hooley, Saunders e Piercy (2001), Hall e Lyford (2002), Pearce e Robinson (2005), Oliveira (2006), Neves (2008), Silva e Batalha (2010) e Soriano, Torres e Rosaleñ (2010)

The methods studied have a specific focus in their applications. Some methods focus on a particular segment; and others on generic methods. The main focus and/or specificity is summarized in Table 24.

TABLE 24: Specific strategic planning methods investigated

Strategic planning method	Focus/specificity of the method
Lambin (2000)	Focus on marketing, taking into account the elements of the marketing mix.
Hooley, Saunders e Piercy (2001)	Strategic planning method of marketing
Hall e Lyford (2002)	This method focuses on the strategic planning commodities industry.
Pearce e Robinson (2005)	Strategic marketing planning, focused on choosing leadership strategies in cost and differentiation.
Oliveira (2006)	This method addresses the strategic planning of a company, focusing its mission and vision.
Neves (2008)	Method of strategic planning and management of agro-industrial systems (chain). Addresses the strategic management of an agro-industrial system in the long term.
Silva e Batalha (2010)	Generic strategic planning method, applicable to any organization.
Soriano, Torres e Rosaleń (2010)	Method helps organizations achieve sustainability targets by integrating sustainability in both planning tasks and strategic management of the organization.

Source: Elaborated by the authors based Lambin (2000), Hooley, Saunders e Piercy (2001), Hall e Lyford (2002), Pearce e Robinson (2005), Oliveira (2006), Neves (2008), Silva e Batalha (2010) e Soriano, Torres e Rosaleń (2010)

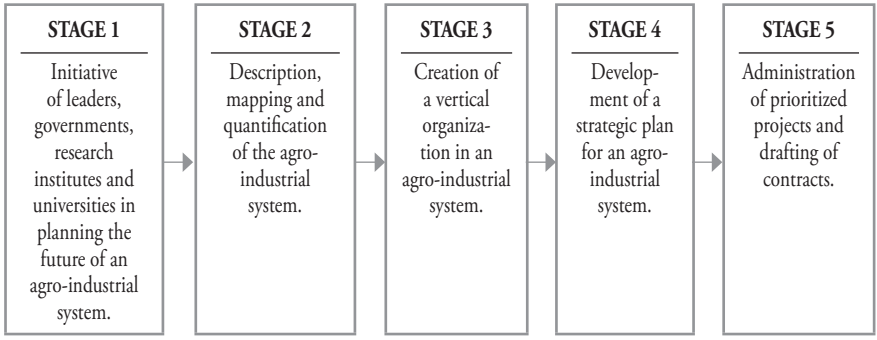
Therefore, the choice of the ChainPlan method for this research was based on its specificity for agribusiness systems, and the success of its previous applications in several other agribusiness systems – including citrus. This method is also known to be more flexible. Other methods studied here are not specific to the agro-industrial system and focus more on the strategic planning of companies, organizations, strategic marketing planning or strategic planning for industry. The focus is always on a particular agent, while the ChainPlan method focuses on the agro-industrial system and all of its agents. Therefore, this method is more accurate and specific to an agro-industrial system.

12.3 Strategic Planning and Management of Agro-industrial Systems (SPMAS) method

The SPMAS method was first conceived by Neves (2004). Since its inception, it has only improved. It has been applied several times in other agro-industrial systems, such as wheat, milk, sugarcane, meat and cotton. The method was also applied in agro-industrial systems abroad, in the wheat and milk chains of Uruguay. (2010) This method has been consolidated in the academic world published in national journals, such as the *Journal of Management* at the University of São Paulo (RAUSP). It was also internationally recognized by the International Food and Agribusiness Management Association (IFAMA) and the European Marketing Academy (Emac).

The method for Strategic Planning and Management of Agro-industrial Systems (SPMAS) is a five-stage process, as shown in Figure 24 below:

FIGURE 24: Method for Strategic Planning and Management of Agro-industrial Systems (SPMAS)



Source: Neves (2008)

Step 1 is the initiative of any existing organization in the industry (usually a trade group), and may be undertaken in conjunction with research institutions and universities and/or government that have the desire to organize a planning process and future vision for the system. Search also takes place at this stage, to identify the key players in the system, along with participating organizations

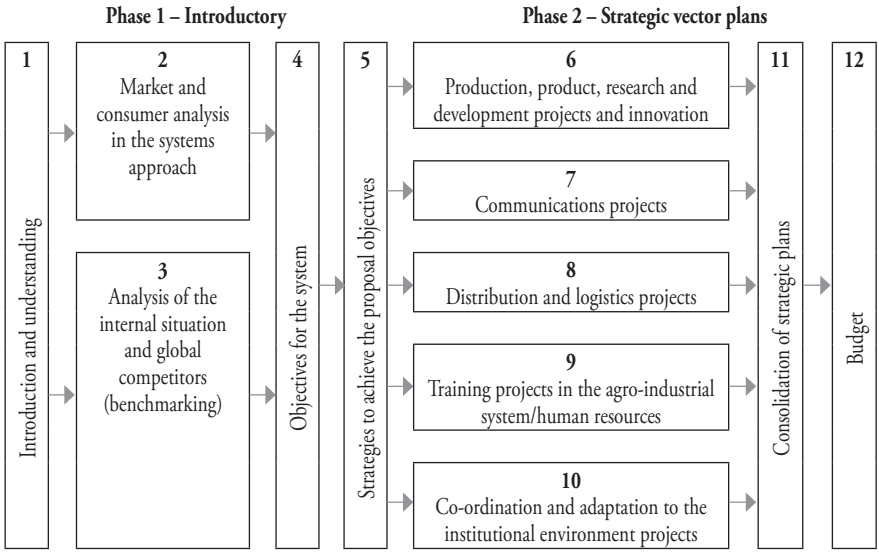
and associations (information on important topics on the agro-industrial system).

Step 2 aims to describe, map and quantify the agro-industrial system. This step has been an important topic of study for the enrichment of scientific knowledge in management, as it brings a systemic approach that allows a vision of the magnitude of the agro-industrial system.

Step 3 deals with the creation of a vertical organization in the agro-industrial system. Many agro-industrial systems are disorganized horizontal associations (same associations as producer associations). Thus, the creation of a vertical organization could contribute to the achievement of certain objectives as an organization; an exchange of existing information; and the discussion of the agro-industrial system strategies in a forum. This would allow for the agribusiness system to work with institutions and on a positive agenda for the sector.

Stage 4 of the SPMAS method deals with the assembly of a strategic plan for the system and is the subject of this study. Neves (2008) proposes 12 steps that can be used to prepare the strategic plan, as shown in Figure 25.

FIGURE 25: Summary of Stage 4 of the SPMAS method



Source: Neves (2008)

The 12 steps for the preparation of the plan are detailed in Table 25. This detail will provide a vision of what should be done in each step.

TABLE 25: Detailed sequence of Step 4 of Method SPMAS

Stages	What has to be done
Phase 01: Introductory	
1. Introduction and understanding	— Verify if the system has other plans made up, and to study them. — Verify the planning method of the studied system. — Verify which teams will be taking part in the process. — Search plans made for production systems (chains) in other countries, for benchmarking. — Find in the team a person who could be a relationship-promoter with other systems (chains). — Finally, it must be verified, in cases of systems (chains) with already sophisticated planning processes, how this model can help the existing model, and gradually adapt the system to this one.
2. Market analysis on chain focus	— Raise threats and opportunities from the so-called uncontrollable variables (possible changes in the legal/political; economical and natural; socio-cultural; and technological environment) both in domestic as well as international markets. — Understand existing barriers (tariffs and non-tariffs) and check collective actions to reduce then. — Analyze the final and intermediate (dealers) consumer's behavior and their purchase decision processes. — Analyze opportunities to fit the environment; fair trade; sustainability; and sustainable development goals. — Analyze opportunities to fit the national and international labor institutional environment. — Settle on an information system, so that you can always be informed and take decisions with support. — Describe main national and international competitors.
3. Analysis of internal situation and competitors (benchmarking)	— Raise all the strong and weak points of the system. — Map contracts and existing forms of co-ordination. — Describe the existing structures of management, along with the transaction characteristics. — Make, also, this analysis in relation to its main competitors. — Analyze value creation, resources and the abilities of the system. — Analyze the factors that are critical to the success of the system. — Select among the systems (chains, which may or may not be a competitor) which areas to benchmark (good ideas sources).
4. Objectives for the chain	Define and quantify the key objectives in terms of production, sales, and imports and exports, to seek sustainable growth and mitigate the weaknesses of the system.
5. Strategies to reach proposed goals	Define the main strategies (actions) in terms of positioning, export, market segmentation and capture value, which can be adopted to achieve the objectives proposed in Step 4.

Stages	What has to be done
Phase 02: Plans of strategic vectors: Production; communication, distribution channels; qualifications; and co-ordination (institutional adequacy)	
6. Production, products, research and development decisions, and innovations	— Analyze the productive potentials and production capacities. — Map and plan for production risks (sanitary and others). — Analyze products and product lines, as well as complementary product lines for expansion decisions. — Raise innovation opportunities in the production system and new products launching. — Seek opportunities to settle national and international innovation networks. — Seek out university partnerships and with medical world. — Detail all offers and offered services. — Take decisions related to the joint market construction and labels for system use. — Analyze and implement the certification process for the production system. — Apply product adequacy to the rules and institutional environment. — Ensure environmental sustainability. — Make packing-related decisions (labels, materials, design). — Calculate recurrent investments at this stage.
7. Communication projects	— Identify the target public who will receive the communication (messages from the production system). — Develop desired goals for this communication (product knowledge, product reminders and persuasion, among others). — Try to reach a unique positioning and message, generated by the system. — Define the communication to be used: – Define an advertisement plan, public relations and advertising promotion on sales, among others. – Make a benchmark for films and international materials already used in other production systems (chains). – Assess communications actions and determine an annual promotion budget involving all of the network agents. – Indicate how communications results will be measured, so the system learns the best tools for the best investment revenue.
8. Logistic and distribution projects (including exports)	— Analyze the product distribution channels and search new, definite distribution objectives, such as market share; type and number of point-of-purchase sales; services to be offered; market information; product promotion; and incentives. — Analyze the possibilities of value capture in distribution channels. — Identify possible wishes of international dealers and consumers to suit the provided services. — Define the entrance way to the markets: Through franchising, joint ventures or other contractual forms, or even vertical integration. — Determine the annual budget for distribution. — Verify how distribution actions can be conducted along with other systems (chains).

Stages	What has to be done
9. Capacitating decisions in the productive chain/ human resources	— Provide training in management for the production system. — Provide manpower technician training; in the control of costs, for use in technologies. — Provide training in national and international sales. — Provide the transmission and access to information from technological centers/ research. — Provide training in food production. — Aid improvement of technical assistance in properties. — Others.
10. Institutional environment co-ordination and adequacy projects	— Launch bureaucratic reduction project in order to get credit. — Launch basic infrastructure improvement project. — Launch fee and incentive homogenization project. — Launch project to increase consume in government programs. — Launch program for isolated productive areas. — Launch project aimed at tax reduction in the production system. — Concentrate on export activity to strengthen trough export promotion agencies. — Work with laws to incentivize the use of technologies (fiscal incentive, etc). — Launch project for product and product name standardization. — Launch project for more transparency in legislation on products and processes. — Make system proposals for conflict solution. — Make co-ordination proposals.
11. Consolidation of strategic plans	Do the consolidation of all projects generated in Steps 6 to 10 and set priorities according to the needs of the system.
12. Budget SPMAS	Set the budgets of all the projects that bring costs, and work out the total budget ChainPlan for agro-industrial system.

Source: Neves (2008)

From Step 4, several projects will emerge. These projects should be worked out based on the traditional stages of a project, with a description and analysis of objectives, actions, performance indicators, and other steps. Step 5 of the method is aimed at the management of priority projects and the preparation of contracts.

12.4 Methodological procedures

According to the study objective – which is to present a strategic plan for the Brazilian citrus agro-industrial system – this research was developed from the application of planning methods and the Strategic Management

of Agro-industrial Systems (chain). This study is geared towards search and data discovery, helping the researcher to delve into the subject. The study is, therefore ,characterized as exploratory research, with a greater focus on understanding the facts than their actual measurement, through exploratory research and qualitative research (Hair JR. et al., 2005; Sellitz et al., 1967; Lazzarini, 1997.

Research stages

This research was divided into three stages. The first stage consisted of the collection of secondary data, through desk research and document analysis. In the second stage, the primary data was collected through in-depth interviews. Finally, the third stage involved the preparation of a strategic plan based on the information acquired in Stages 1 and 2.

Stage 1: Desk research and document analysis for understanding and the collection of secondary data

At this stage, research was conducted via a survey of secondary data, through desk research and documentary analysis. It is initially important to distinguish bibliographic research (desk research) and document analysis. A literature review is a study of scientific sources and can be used for books, periodicals and scientific articles. Already, documentary research has the feature of searching for information in documents that do not have a scientific treatment, such as executive reports and release materials (Oliveira A, 2007). Both forms of research are integrated and complete in this survey.

The survey of secondary data for this research was done through scientific articles (databases, scientific journals, and national and international journals); newspaper articles; journals in the industry; books; industry insights ;databases and governments; among other sources. We sought to further analyze previous strategic plans, or even guidelines and strategic agendas of government agencies and industry. Data collection occurred from March 2014 to January 2015.

Stage 2: Field research: Interviews with industry experts and data tabulation

At this stage, a semi-structured script with open questions was organized. This sought to raise, through its application to industry experts, the main difficulties faced by the chain, and how in the opinion of these experts, these problems can be mitigated. The authors introduced a pre-test script to two citrus industry experts for script validation. We opted for the semi-structured interviews because we were able define the amount of information and achieve greater direction and intervention so that the objectives were achieved. (Boni and Lent, 2005).

For this research, a non-probabilistic intentional sample of respondents was used. According to Matar (1996), a non-probabilistic intentional sample is a population chosen by the researcher in order to obtain a sample that is satisfactory for the need of research, and whose responses obtained will be of profound knowledge. Seven interviews with experts were conducted. As announced at the beginning of the research, the names of the experts were not disclosed, but the choice of these specialists was related to their position in the citrus agribusiness system. Seven in-depth interviews were conducted between April and May 2014. The positions occupied by the respondents in the agro-industrial system are outlined in Table 26.

TABLE 26: Occupations of interviewed experts

Expert	Occupation
Expert 1	Researcher important in research center in citrus production in the State of São Paulo
Expert 2	Researcher and university professor in agricultural economics at the University of São Paulo and an expert on citrus
Expert 3	Association chair of agricultural inputs link (specific to citrus)
Expert 4	Association president of citrus producers and director of orange juice industry
Expert 5	Consultant and expert in economics and management in citrus
Expert 6	Citrus farmer, consultant and specialist in citrus market
Expert 7	Representative of citrus industries

Source: Authors

From these interviews, we gleaned information about the current scenario of the Brazilian and global citrus production and the future prospects of the sector. They also identified actions that were needed to strengthen the sector.

After interviews with the experts, the objectives and strategic projects were consolidated by the author. The results were then proposed for the chain. These objectives and projects were submitted to the respondents for the evaluation and validation of the proposals made by the authors. This also involved the prioritization of the projects, which was carried out using two variables: Relevance, which speaks to the importance and impact of the project; and urgency, which speaks to the need, and that which cannot be postponed. For each variable (relevance and urgency), the experts attributed a note, ranging from 0 to 10. O indicated a project without relevance and urgency, and 10 marked an extremely important and urgent project. The marks awarded for each variable were multiplied to obtain the final score (core) of the project.

Stage 3: Strategic plan elaboration

For the construction of the strategic plan, as proposed in the objectives of this research, we used the SPMAS method, developed by Neves (2008). This method as described in the literature review, consists of five steps, of which the Step 4 offers 12 phases for the assembly of a strategic plan. Therefore, the results of this research are presented in accordance with the 12 stages of the method.

12.5 Results

Introduction and understanding

Since its establishment, the sector has gone through several crises, and also more profitable times. According to Neves et al. (2010), there is a clear perception that the industry is in need of permanent organization; a plan and a policy developed by all links. This lack of planning, clearly defined strategy

and organization of the agro-industrial system, when linked to the economic and social importance of citrus production for Brazil, justifies the motivation for this research.

Market and consumer analysis with a systems approach

In recent years, world production of orange juice has fallen. According to the USDA, in the last 20 years, the fall in world juice production was 11,6% (equivalent to 247,000 tonnes). These reductions were mainly in Florida (325,000 tonnes) and on the Brazilian citrus belt (48,000 tonnes). Even with the reductions, these two regions account for about 82% of world production of orange juice, and the Brazilian citrus belt produces about 57% of all world production, and Florida, 26%.

With respect to consumption, according to data provided by CitrusBR, the orange flavor had a 33% stake in relation to other fruits in 2013. In the period 2003-2013, in the juice category there was a 17% reduction in demand for orange flavor. In the case of nectars and soft drinks, orange flavor increased the volume consumed by 30% and 73% respectively.

Analyzing data from Tetra Pack (2014) on global consumption of orange juice in FCOJ (frozen concentrated orange juice) equivalent to 66°Brix, consumption decreased 10.8%, from 2,406,000 tonnes in 2003 to 2,146,000 tonnes in 2013. This decline is most pronounced in the main consumer markets: The United States, Germany, France and the UK, which fell by 381,000 tonnes in consumption.

Despite the major consumer markets falling, there are still opportunities, as emerging countries are increasing their consumption of orange-flavored drinks. Only countries belonging to the BRICs (Brazil, Russia, India and China), as well as Mexico, increased their consumption by 71%, from 174,000 tonnes in 2003 to 298,000 tonnes in 2013.

When looking at the dynamics of the international market, a concentration of the agro-industrial system links can be observed. According to data from Tetra Pak (2014), the top five retailers had an average share of total sales: 48.5% retail in the United States, 62.9% in the UK, 72.8% in France and 75.6% in Germany. In addition to the concentration of large retail chains, there is

also a focus on smaller retailers, who are organizing into purchasing pools, or purchasing organizations. This retail concentration affects orange juice negotiations, as it gives greater bargaining and negotiation power to retailers. It thus puts pressure on prices and also decreases the alternative distribution channels, as they have a higher share of the sale of food and beverages.

Bottlers are also involved in this concentration. According to data from Tetra Pak (2014), in 2009, 71% of the juice produced in the world was bought and bottled by only 30 bottlers. Of this total, the top 10 bottlers accounted for 52% of the entire market. Bottling companies are often multiproduct companies, so bottlers give preference to products with higher turnover and better profit margins. They, therefore, opt for products with lower raw material costs.

Table 27 notes the key facts and actions mentioned by experts in the analysis of the external environment.

Therefore, from an analysis of the external market, the main problems can be identified as the decline in global demand; increased competition with other products; a change in the juice consumption profile; and the concentration of the links. According to experts, the big opportunity is in the increase of consumption in less traditional markets. We need to focus on, and invest in, communication in these countries, so that consumption will continue to increase. This also needs to continue in traditional markets.

TABLE 27: An analysis of the opportunities, threats and actions for the citrus agro-industrial system

Opportunities
— Increase the consumption of soft drinks and nectars.
— Increasing consumption in emerging countries.
— Economic growth in developing countries.
— Increased installation of Brazilian processing industries abroad.
— Product with healthy appeal and good nutritional characteristics.
Threats
— High dependence on external market.
— Increasing launches of innovative beverages.
— Concentration of the retail sector and bottlers.
— High tariff barriers imposed by major buyers markets.

Strategic actions
— Concentration of marketing efforts aimed at recovering consumption in key market in a downturn.
— Project development of emerging markets.
— Diversification of distribution channels and development effort of the major brands.
— Implementation of inventory replenishment policy to generate income, and Consecitrus to distribute income.
— Diversify buyers markets.
— Encourage the use of NFC in markets with greater purchasing power.

Source: Prepared by the authors from interviews

Analysis of the internal situation and global competitors

In the 2013/14 harvest, Brazil produced 1,078,000 tonnes of orange juice (equivalent to 66°Brix) – about 57% of world production. In average years, the country has maintained stable orange juice production, with some production peaks. On the other hand, orange processing increased by almost 35 million 40.8kg orange boxes, and the country started to process more orange in a 120-year period. This orange processing increase and stable production of juice reflects a decrease in industrial output in Brazil. In the season 1995/96, 248 40.8kg orange boxes were needed to produce a tonne of juice to 66°Brix. In 2013/14, 282 40.8kg orange boxes were required (Neves et al., 2012; CitrusBR, 2014; USDA, 2014).

In addition, the competitiveness of the Brazilian orange juice industry has declined over the years. According to the study by Neves et al. (2010), industrial average costs for processing and the disposal of orange juice in Brazil jumped from US$347.54 per tonne of FCOJ in 2003 to US$534.28 in 2010. This marks an increase of 54% for the period.

It was not only industrial production that marked cost increases. Agricultural production faced a similar experience, too. Operating costs of the orchard industry doubled in that period, with an increase of 120 . This led to the cost increase from R$3.30 for an orange box in 2000/01 to R$7.26 in 2009/10.

When analyzing the stratification productivity band for the 2012/13 crop (MB Agro, 2013), it appears that 59% of the average hectare yield is 594 box per hectare. Kalaki (2014) realized profitability simulations and came to the

conclusion that in only 40% of the hectares, or 58.7% of the production, would get positive financial results in the citrus industry.

According to experts interviewed, other problems devastate the citrus industry, too. These include high fluctuations in juice prices on the stock market bring fluctuations in the price of the fruit to the citrus producer; the low turnover rate of orchards and aging leads to lower productivity; a lack of research and development of new products; as well as legislative instability and protection through tariff and non-tariff barriers in importing markets. Respondents also pointed to opportunities such as the operation of the internal market of orange juice as an area of great potential. In Table 28, the main strengths, weaknesses and strategic actions identified by respondents were raised.

In the analysis of the internal environment, the SPMAS method recommends important tools of analysis, as well as points to analyze. The authors have incorporated a summary table compiled from the interviews, which identifies the main strengths and weaknesses of the sector. From this, we are able to draw actions to mitigate the weaknesses and strengthen the forces of the agro-industrial system. This framework allows a quick view of the main experiences of the industry and allows for the design of strategic projects.

TABLE 28: Analysis of strengths, weaknesses and actions for the citrus agro-industrial system

Strengths
— Many of the groves demonstrate high productivity.
— Brazil is beginning to diversify export markets.
— Agro-industrial systems have great social importance, since 87% of producers are small.
— Agricultural and industrial production costs are lower than of other producing countries.
— Control of all links in the internal market to delivery in international ports is beneficial.
Weaknesses
— Lack of positioning in the consumer markets.
Exports are concentrated in a few markets.
High increase in agricultural costs, industrial and logistics.
59% of groves have suboptimal productivity to ensure a return on invested capital.
Infrastructure, agricultural and industrial run-off is insufficient.

Strategic actions
— Increase productivity in order to remain competitive in the market.
— Renew production; invest in research; strengthen agricultural insurance; expand citrus into new areas with the possibility of high technology and even social inclusion.
— Encourage practices of collective action among producers.
— Strengthen class organization by the producers.
— Improve agronomic technical training for executive and management processes and growers.
— Develop customized credit lines for revitalization of the citrus industry; research and development; and extension activities for the dissemination of technology to producers and mechanization.
— Put the orange juice to Brazilian and international consumers.
— Invest in infrastructure.

Source: Prepared by the authors from interviews

Strategic goals for the agro-industrial system

This topic of study reveals the strategic objectives that seek to mitigate the negative effects experienced by the sector, and to improve its strengths by seeking to take advantage of market opportunities, thus providing greater competitiveness for the sector. The objectives were defined by the authors based on external and internal analysis of the agro-industrial system and interviews. These objectives have been assessed and validated by experts interviewed and are presented in Table 29.

The strategies adopted to achieve these objectives

This research topic describes the main strategies to be adopted by the Brazilian agro-industrial citrus system. Ansof (1965) explained the concept of objectives and strategies, defining the objective as being where it wants to go, and the strategy being the way to achieve the objective. Based on the theory proposed by Ansof (1965), Kotler (2000) and Grant (2002), and as well the results of interviews with experts, three strategies have been defined for citriculture in Brazil: A differentiation and market positioning strategy; a strategy for growth and development; and a strategy to sustain competitive advantage.

TABLE 29: Strategic goals for the agro-industrial citrus system

Strategic objectives
— Increase the competitiveness of Brazilian citrus production.
— Strengthen and encourage research and development of new technologies, such as plant improvement; the development of new molecules; new management tools; new industrial products; among others.
— Continuously promote the development of citrus sustainability.
— Seek out increased demand of the agro-industrial citrus system products and the diversification of markets and products.
— Increase the volume and dissemination of information and transparency for the whole agro-industrial system.
— Improve the distribution structure of agricultural and industrial production.
— Qualify and create conditions to attract human resources into citriculture.
— Increase the co-ordination of the agro-industrial system and improve the business environment.

Source: Prepared by the author

12.6 Strategic projects

The proposition of the projects was made from an analysis of the external and internal environment and interviews with industry experts. These proposed strategic projects are aimed at achieving the objectives set for the agro-industrial system. The projects are designed to contain their specific objectives, as well as the actions required to achieve specific objectives, as proposed in SPMAS method. The projects proposed by the authors have been assessed and validated by experts interviewed. Table 30 presents the strategic projects, objectives and key actions.

The SPMAS method provides suggestions for the types of actions and information that projects should and/or can contain. The suggestions made by the method covered, which includes all the facts and needs encountered by citrus agribusiness system. In this research, the authors have adapted the method, inserting a new strategic vector with a sustainable development project for agro-industrial system.

TABLE 30: Strategic projects for the citrus agro-industrial system

Strategic projects	Project objectives	Actions necessary to achieve objectives
Competitiveness of Brazilian citrus production	— Increase the competitiveness of Brazilian citrus production, mainly through productivity gains from improvements in fruit quality and reduced sanitary problems. — Improve and stabilize the profitability of the activity to the Brazilian citrus producer, aiming for continuity in the activity.	— Improve and increase the technical assistance received by producers. — Increase the renewal rate of the orchards. — Perform benchmark programs among producers in order to achieve better cost controls and management techniques through the exchange of information between them.
Development of Research and Technology	— Strengthen and encourage the development of research, and the dissemination of new technologies.	— Increase public funds for research on citrus. — Search partnership with private companies for investments in research and new technologies. — Strengthen research institutions such as Fundecitrus, APTA, universities, and GTACC e GCONCI.
Phytosanitary improvement	— Seek to improve phytosanitation in the orchards and mitigate the problems that have plagued Brazilian citriculture.	— Encourage the practice of collective action between farmers, through joint applications for plant protection. — Increase supervision of groves around health issues. — Encourage private institutions to research new pesticide molecules registered for citrus.
Sustainable development of agro-industrial systems	— Promote and permanently seek the sustainable development of the agro-industrial citrus system by stimulating sustainable practices along the entire chain.	— Create new certifications and regulations for conscientious and responsible production, and ensure to existing ones. — Implement an impact management of natural resources and residues from the agricultural and industrial production.
Communication in the Internal market	— Encourage, through communication and marketing, increased consumption of processed orange juice and orange-flavored drinks with higher juice content in the internal market.	— Stimulate the industrialized orange juice consumption habits in the internal market. — Promote specific communication influential opinions, such as doctors, teachers, journalists, about the nutritional benefits and the importance of the development of citrus in the agro-industrial system in Brazil. — Insert the orange juice in school meals. — Create a new product and specific juice brand for the domestic market – The Consortium Consecitrus.

Strategic projects	Project objectives	Actions necessary to achieve objectives
Communication in the International Market	— Carry out marketing and communication efforts to increase and recover the consumption of citrus products in the main falling markets, and seek to increase consumption in potential markets.	— Create a communication fund and marketing between industries, growers, government and other agents of the agro-industrial system. — Reposition the Brazilian citrus chain products as high-quality and sustainable. — Create joint partnerships for orange juice promotion between Brazil, and bottled and international retail industries, to seek the resumption of orange juice drinking.
Intelligence Center of Brazilian Citriculture (CICB)	— Develop a Citriculture Permanent Intelligence Center that aims to create a centralized platform for the dissemination of all information in the agro-industrial citrus system. The purpose would bet to provide a greater volume of information, transparency and intelligence gains for the, so that all agents can have the same level of information.	— Agency Creation: Brazilian Citrus Intelligence Center (CICB). — Install a surveying system for the information. — Carry out strategic reports and market analysis.
Distribution and Logistics	— Promote improved logistics and distribution infrastructure, as well as maintenance and conservation of distribution infrastructure.	— Articulate with the federal, state and local government, more resources for investment in infrastructure, especially in ports. — Promote the conservation and permanent maintenance of the main roads of transportation of production. — Improve port infrastructure and access to ports.
International commercialization	— Seek a better international marketing environment and conditions and forms of marketing. — Also aim to increase the value exported by citrus companies, and diversify the products and target markets.	— Diversify juice marketing channels, while seeking to negotiate with smaller bottlers and decrease the concentration of sales of current bottlers. — Promote tax exemptions for exports of other citrus products, aimed at encouraging the consumption and export of these products. — Search bilateral agreements between buyers markets, with the aim of providing better trading conditions.
Qualification of agents of the Agro-industrial System	— Qualify and train the various human resources working in the agro-industrial system, to promote increased system productivity and conditions to attract human resources to work in citriculture.	— Create a training and development fund for citrus. — Search incentives to attract active agents in the chain so that they do not migrate to other sectors. — Strengthen existing specific educational courses for the citrus industry, such as the master's course offered by Fundecitrus, and the creation of new courses.

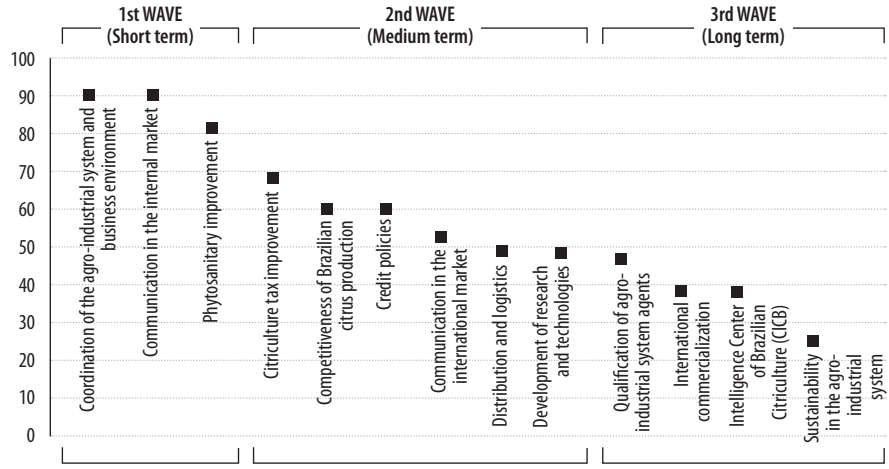
Strategic projects	Project objectives	Actions necessary to achieve objectives
Co-ordination of the agro-industrial system and Business environment	— Provide a better business environment in the agro-industrial citrus system and seek a more co-ordinated system, with a closer relationship between links and system agents. — Work jointly and in a co-ordinated way to benefit the sector, while seeking to improve commercialization conditions in the agro-industrial citrus system.	— Strengthen organizations representing classes. — Find a close relationship between the class representative organizations. — Work collective actions between the links of the chain. — Encourage associations and co-operatives, especially among small producers, seeking higher competitive rates for them. — Implement the Consecitrus system, aimed at the equitable distribution of results between producers and industries, and the improvement of marketing conditions between the links.
Credit in citriculture	— Make more resources available to the agro-industrial citrus system, thus encouraging greater investment in the sector.	— Develop special lines of credit for the renewal of old groves, and to develop new groves, with a minimum grace period of four years.Develop specific lines of credit for investments in new technologies in citrus. — Review and systematically assess credit policies for the sector.
Improvement of tax in citriculture	— Provide tax incentives for the agro-industrial citrus system to increase its competitiveness. This seeks to decrease the tax burden of the Brazilian citrus chain and co-ordinate improvements in tax policy.	— Seek from the federal and state governments a reduction of the high tax on citrus products. — Search tax incentives for drinks with more orange juice content. — Review and co-ordinate the continuous improvement in tax policies incidents in the citrus chain.

Source: The authors

12.7 Consolidation of strategic projects

According to the methodology, the projects were prioritized for the experts according to their importance and urgency. In the sequence of the final scores, the projects were ranked in descending order of score, then separated didactically into three phases, called waves. These are equivalent to projects to be realized in the short, medium and long term. The result of this classification is shown in Figure 26.

FIGURE 26: Prioritization of strategic projects



Source: Elaborated by the author

The SPMAS method does not clearly provide for how projects should be prioritized. The authors chose the criteria described above, because that criteria had good empirical results in other agro-industrial systems in which the method was applied.

Thus, with the objectives, strategies, strategic projects and prioritization of defined projects, the authors designed the strategic map for the agro-industrial citrus system (Figure 27 on page 140).

12.8 Conclusions

The Brazilian agro-industrial citrus system is a consolidated one that is important to the development of the economy. It is a clear perception that the industry is in need of permanent organization that addresses all links of the agro-industrial system. It also needs a plan and a policy, developed for all links and used by all links. Peterson et al. (2000) emphasizes that to ensure the success of the entire chain, planning is necessary – and all members must

be involved. In this way, this study contributes to the sector by seeking greater organization and co-ordination in the agro-industrial system.

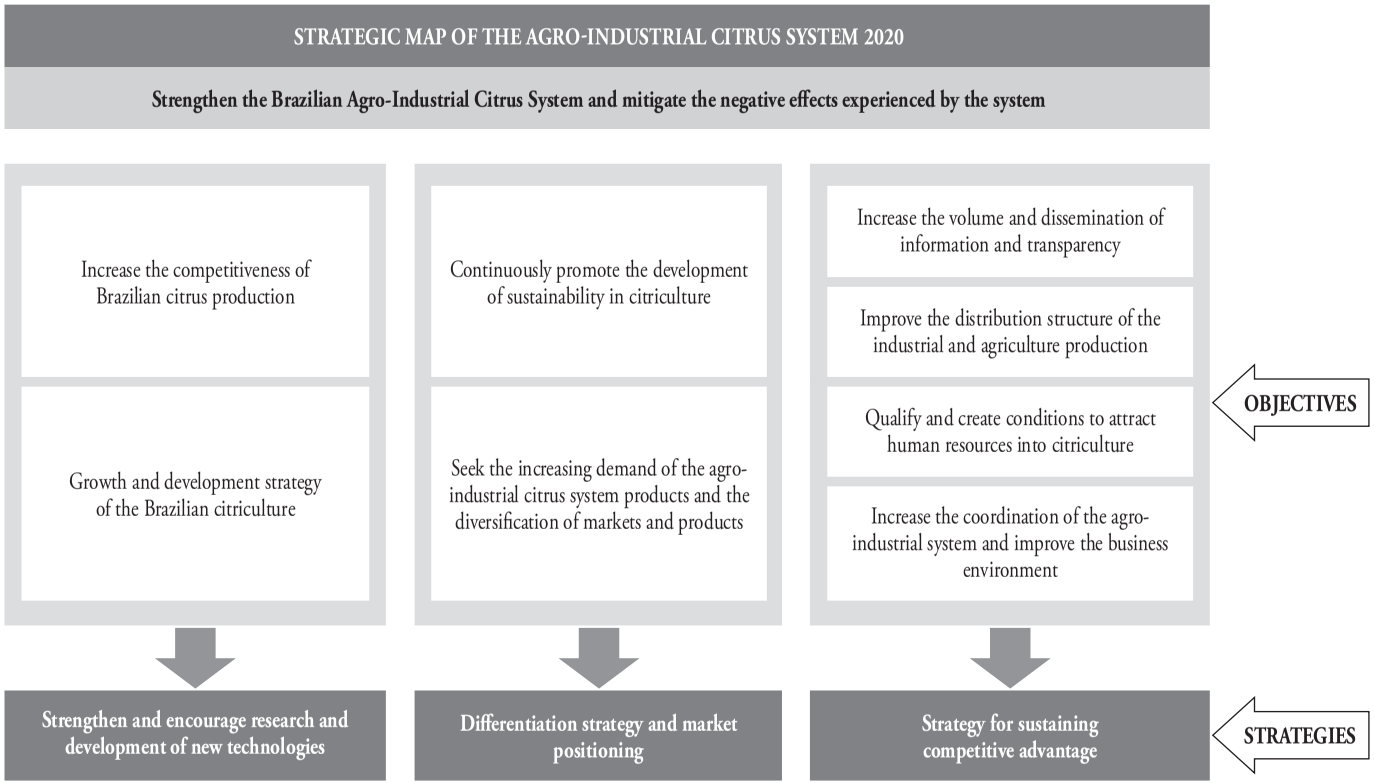
The study also contributes to a better understanding of the system and can act as a tool to assist in decision-making. It may also enable the stimulation of future strategic plans for the sector, as well as future research on the needs and necessary actions to increase the competitiveness of the agro-industrial citrus system.

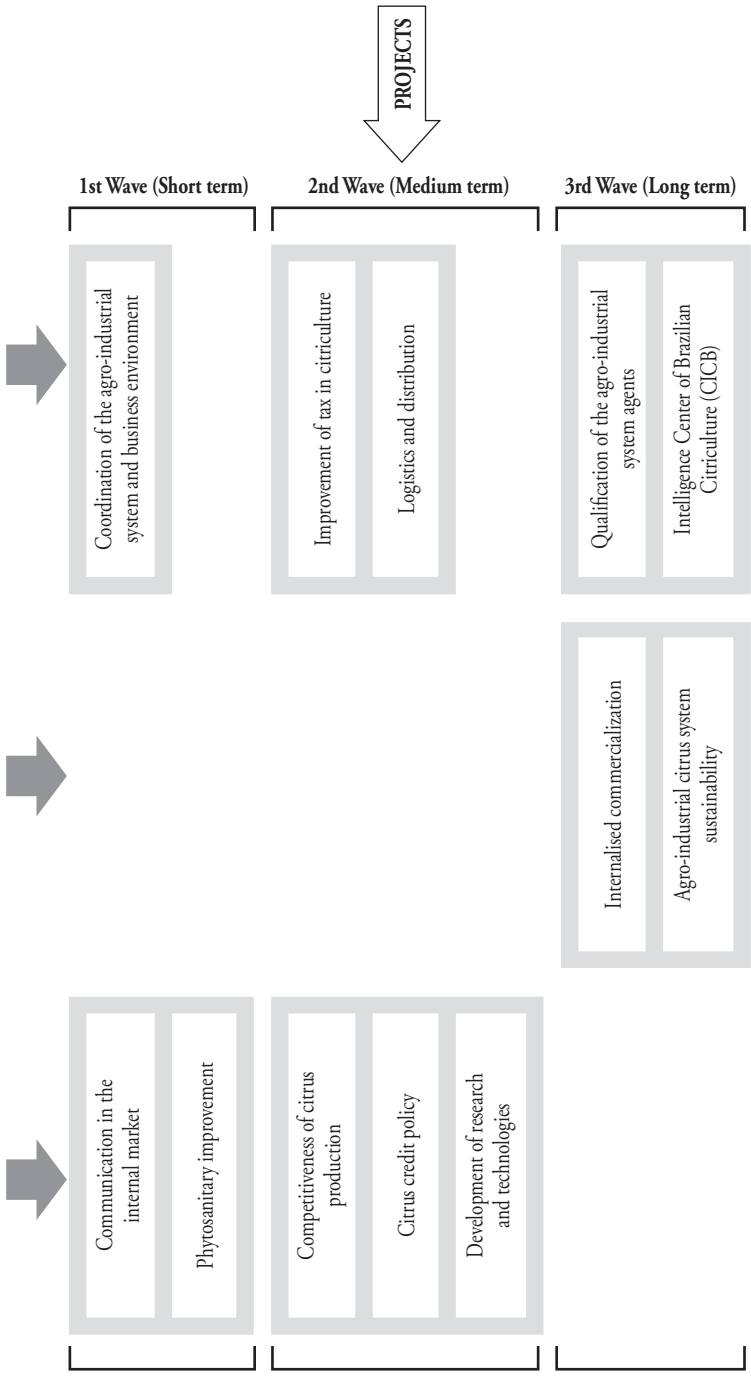
As it was not quantitative in nature, the study had some limitations, such as the number of interviews. In future, studies should ideally quantitative. Another limitation is the budget plan, which was not done because it was not defined by each link as a financial contribution to the plan's activation. It can, therefore, not be implemented as an action plan as it has not raised the resources for each link. The SPMAS method for preparing the strategic plan used in this study proved to be an important agro-industrial management system tool. Some adjustments were necessary at certain stages, which demonstrated another strong point of the method: It has easy applicability, allowing for possible adaptations. Another positive point is that the method uses primary and secondary sources, which facilitates regular review, update and continuous improvement. The methods also empirically validated its application in an agro-industrial citrus system.

This study generated some contributions to improving the SPMAS method, especially when applied to the citrus industry. The method did not have the need for sustainable production projects, with specific actions for sustainability in agricultural and industrial production, too. This study was proposed as a specific project for the theme. The study also brought the frame construction of the contribution made from interviews with experts, in which the main opportunities were identified, along with the threats, strengths and weaknesses of the agro-industrial system, and the proposition of actions by respondents. In this research, it was observed that the prioritization of projects, using the urgency and relevance variables, was approved empirically as a way for project prioritization.

In conclusion, the study generated contributions to improve the Strategic Planning and Management of Agro-industrial Systems (SPMAS) method. It was also provided contributions to the citrus sector, increasing knowledge and information.

FIGURE 27: Strategic map of the agro-industrial citrus system 2020





Source: Prepared by the author

13

IMPROVING SUSTAINABILITY FOR FOOD AND JUICE COMPANIES

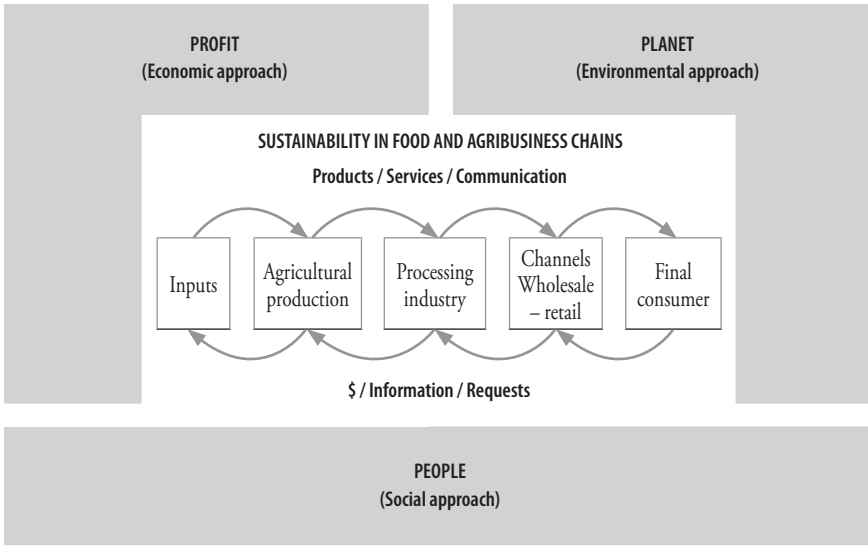
Sustainability, previously defined as "responsible use of exhaustible energy resources and raw materials", has gained massive awareness the world over. This awareness could be explained by a rise in the expectations of consumers and the emergence of a new generations that are increasingly worried about the condition of the planet; the scarcity of natural resources; global climate change; the impact of social media; the bad behavior of companies; excess pollution and all forms of behavior.

At a company level, there is a growing concern that we have to reduce the environmental impact of our activities; increase transparency (corporate social responsibility); provide a better flow of information; promote more inclusion and less social imbalance; and increase our companies' usage of natural and renewable resources/energy.

Sustainability has three traditional pillars in which development should be promoted: The economic dimension (profit), the environment dimension (planet) and the social dimension (people).

The objective here is to propose a framework to help companies and governments with the sustainability discussion and agenda. Each topic may be considered to evaluate what companies are doing and what they can do in terms of activities – and also importantly, to measure and communicate these activities.

FIGURE 28: The sustainability pillars of an agribusiness system or chain



Source: Neves, Marcos Fava –The Future of Food Business, *World Scientific* (2013).

On the economic (profit) side, some important factors to be considered are:

— Promoting economic development.
— Targeting social equality.
— Promoting opportunities (amount of salaries paid and other contributions).
— Providing a respectful product or service to the consumer.
— Taking good care of all stakeholders, and increasing stakeholders' engagement.
— Providing improvements in infrastructure (such as rural roads).
— Pricing products adequately/fairly.
— When possible, offering long-term purchase agreements for suppliers.
— Buying in the community (measuring how much is spent in the region).
— Working with transparency, ethics and integrity.
— Supporting smallholders with technology.

— Improving technology usage for the company and its suppliers.
— Calculating the amount of sales taxes paid and the contribution to local GDP.
— Measuring the economic situation before and after the investment (number of companies, and others).
— Continually searching for efficiency gains.
— Stimulating the shared economy.

On the environmental (planet) side, some important actions to be considered are:

— Working out how to produce with efficiency and responsibility towards environment.
— Following environmental rules.
— Protecting biodiversity.
— Protecting forests/reducing deforestation and increasing the recovery of degraded areas (amount of trees planted).
— Improving soil quality/reducing degradation.
— Using sustainable sources of energy and increasing shares of renewable energy.
— Improving the self-generation of energy.
— Reducing waste.
— Recycling.
— Co-ordinating the environmental protection efforts of the suppliers of the company.
— Increasing water use efficiency in direct operations and supply chains and water discharge quality.
— Measuring the water, carbon, energy footprint (for an item).
— Reducing vulnerability to climate risk in the supply chain.
— Taking care of the impacts of chemicals and others, and improving natural methods of pest control.
— Stimulating a "circular economy".

On the social (people) side, some important actions to be considered are:

— Promoting good working conditions (safety, health, water, housing and sanitation infrastructure).
— Strictly following labor laws.
— Providing adequate salaries and sharing early results in performance programs.
— Ensuring good health and well-being of all stakeholders.
— Promoting gender equity and women empowerment.
— Eliminating child labor.
— Providing sources of community improvement.
— Ensuring ethics and integrity (rights; safety; efficiency; support; human resources; infrastructure; elimination of work incidents; improving health programs; and implementing programs that encourage the respect of differences).
— Building a supplier's code of conduct.
— Helping to develop skills and improve labor.
— Investing in educational programs.
— Improving usage of local people in the workforce.
— Improving partnerships with the public sector for social projects.
— Stimulating smallholders' inclusion.
— Start program for inclusion of the disabled.

This list is not exhaustive. A good exercise for the professionals working in this area would be to look at the websites of companies that are doing good work in the area of sustainability; download their materials; and find new ideas to implement. Society wins with more sustainability in the economic (profit), environmental (planet) and social (people) pillars.

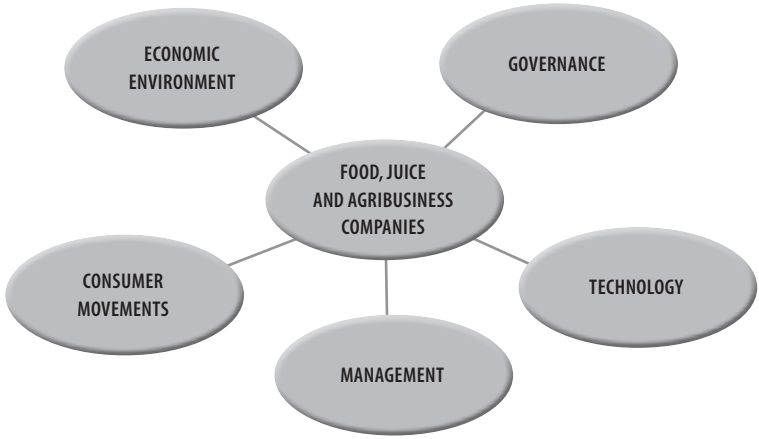
14

GLOBAL TRENDS FOR FOOD, FRUIT AND JUICE COMPANIES

The objective of this article is to list some of the global trends in the macro environment of food, fruit and juice companies. Five major areas, as seen in the following figure, have been identified. This is where changes are impacting food, juice and agribusiness companies, affecting the environment, governance, consumer movements, technology and management.

This list is far from complete, but merely hopes to help companies monitor some of the trends and identify threats and opportunities. In that way, they may be prepared to react and neutralize, or even take advantage of, whatever comes their way. This list is based on recent research and strategic plans done for food companies and board meetings.

FIGURE 29: Macro-environmental trends for fruit, food and juice companies



14.1 Consumer movements

When it comes to customer movements, the following topics deserve the attention of food and juice companies:

— The issue of waste, recycling, reuse, and consumers giving value to the circular economy.
— Concerns with inclusion and social innovation (smallholder enhancement).
— Food miles (carbon emissions).
— Empowerment of "buy local" and other regional products consumption movements.
— Demands for more information and country of origin denominations.
— Ethnic foods, artisanal products (home-made), organic and other consumer experiences.
— An increasing sophistication of companion animals (pet) food.
— The slow-food movement, which involves making a meal a rest, dialogue and even a thinking moment.
— Direct farmer-to-consumer channels (farmer's markets).
— Cultures differ in markets along with consumer's behavior, diets, lifestyles, insights.
— Increasing purchasing power of consumers and available choices.
— Focus on land use (preservation) and animal welfare.
— Climate change and climate related issues.
— Concerns with carbon measurement and management (carbon footprint).
— Ethics, ethical living and responsibility.
— The wish to simplify life, along with time-saving movements (buying time).
— Older (+65) population demands (will double until 2030).
— Totally connected food consumers.

The next topic with deal with the fast changing economic environment.

14.2 The economic environment

The following topics deserve the attention of food and juice companies:

— Global economic growth and development.
— Fewer economic borders (more agreements and trade).
— Demand growth and diet changes.
— Increasing external impacts and capacity to adapt (flexibility).
— Growth of bio-economy (biomass, bioplastic, biofuel, bioelectricity) based chains.
— Scarcity of natural resources scarcity.
— Productivity levels and gaps in different regions.
— Circular economy (using by-products as inputs).
— Global investors and faster capital flows (credit), with new currencies coming in.
— Terrorist risks on food stocks and food transport.
— Volatility in world food prices.
— Asian and emerging driven world (70% of world GDP in 2030).
— Searching for inequalities solution: Poverty and hunger.
— Increasing value of biodiversity.
— Education as a basic source for competitiveness.
— Sharing economy ("Uber" models).
— The food bridge: From the Americas (food production) to Asia (food consumption).
— New ways of working (at home, part-time and others).
— New sources of protectionism.
— Job insecurity.
— Public (government) debt.

The next topic deals with governance.

14.3 Governance (co-ordination)

The following topics deserve the attention of food and juice companies:
— Design, planning, performance and governance of integrated food chains.
— Increasing collaboration and relationships in chains.
— Metropolitan agricultural chains (producing in cities); indoor farms; green roofs and other surfaces.
— Governmental/public policies, interventions and regulations.
— Chain agents (intermediaries) value equation (removing value extractors).
— The growing presence of digital contracts.
— More transparent income allocation (profit pools) and distribution.
— New types of insurances and other risk management tools.
— The evolving role of NGOs (non-governmental organizations).
— Governance increasingly linked to consumer demands and obligations.

The next topic deals with the fast-changing technological environment.

14.4 Technology

The following topics deserve the attention of food and juice companies:
— The increasing flow of information, transparency, traceability and identity preservation.
— Higher levels of innovation and entrepreneurship in food chains.
— Smart farms: Digital farming everywhere with GPS-guided equipment, data-driven drones, analytics software and advanced equipment.
— Increasing data generation, ownership and usage.
— The convergence of industries (food and medicine, food and cosmetics and others).

— Genetically-modified organisms to address plant resistance, resource usage, productivity and consumption.
— Increasing use of biotech, genomics, traits, fungi, bacteria and others.
— The enhancement of intellectual property.
— Natural lab-produced food substitutes (food coming from different sources).
— Organic market segments and yields.
— The increasing number of start-ups.
— The increasing amplitude of tablets/phones and their services.
— Artificial intelligence (robots).
— 3-D printing (seeds and others).
— Energy sources (solar power and others).
— Totally digital world and internet acceptance.

The next topic deals with management challenges and opportunities.

14.5 Management

The following deserves the attention of food and juice companies:
— Increasing levels of security (data, quality, assurance, zero contamination).
— Certification movements.
— Consumer communication tools (from in-person to digital platforms).
— The search for talents, skills, human resources.
— The capacity to adapt to differences.
— Increasing innovations related to services, experiences and relationship marketing.
— Diversification towards complete solutions: A chemical company to a seed company; to precision planting; to climate corporation and hi-tech services.
— Increasing entrepreneurial culture, vision and mission.
— More collaborative networks of companies (integrations).
— Authenticity, ethics and openness to consumers.

— Efficient go-to-market strategies with increasing relationships.
— New role of influencers.

These are some of the important topics to be monitored by companies in order to expand their management capacity and to prepare for changes in macro-environmental trends.

15

BRAZILIAN 2018/19 CROP FORECAST

The 2018/2019 orange crop forecast, published on May 9 2018 by Fundecitrus, in co-operation with Markestrat, FEA-RP/USP and FCAV/Unesp[12] is of 288.29 million boxes of 40.8kg each. This total includes:

— 55.81 million boxes of the Hamlin, Westin and Rubi varieties.
— 16.55 million boxes of the Valencia Americana, Seleta and Pineapple varieties.
— 81.16 million boxes of the Pera Rio variety.
— 99.80 million boxes of the Valencia and Valencia Folha Murcha varieties.
— 34.97 million boxes of the Natal variety

15.1 Bearing trees

Bearing trees of the varieties that make up this estimate total 175.27 million. Information about bearing trees was obtained from the *Tree Inventory for São Paulo and West-south-west of Minas Gerais Citrus Belt*: March 2018 status, defined by the new mapping of groves performed from September 08 2017, to January 29 2018, and by counting trees present in 5% of plots mapped, from January 29 to March 07 2018.

The georeferenced mapping, carried out for the first time at the 2015 inventory, has been through a complete update for this 2018 inventory. New

12 Department of Math and Science, Jaboticabal.

high-definition orthorectified images were obtained by the satellites SPOT 6&7 from European Airbus Defence and Space between May and August 2017. In September 2017, images were made available to survey agents, together with drawings of plots identified in the previous mapping. These were superimposed on the images for easier visualization of areas that should be visited to collect *in loco* data.

Scanning or visual inspection of images were also employed by survey agents before they went to the field to pre-identify citrus groves planted after the previous mapping of 2015–2017, which should also be visited.

No information relative to the plot, other than their outlines, was supplied to survey agents. All new data needed to be collected in the following areas: Variety; year set; spacing; visual aspect of plants; and irrigation system, when present[13]. Recently collected data relative to the variety and year set that differed from the previous register were audited for validation. Outlines of plots were redrawn to correspond to their present area, whenever their area was changed after plots had been registered in the previous mapping.

Field visits identified plots that had been abandoned or eradicated after the 2015 inventory, and those identified in that mapping as being in a similar situation. A new feature in the current mapping is the delimitation of farms, which more precisely quantifies farms present in the citrus belt.

For the tree inventory, 5% of mapped orange plots were drawn, to be visited again and to have their planting holes classified and quantified. Each tree present in the plot was classified into one of four age groups: Zero (up to two years old); one (from three to five years old); two (from six to 10 years old); and three (over 10 years old). Dead and missing trees were also accounted for. Plots were chosen through a random drawing that employed a proportionate stratified sampling technique. Stratification variables were: 12 regions, five orange varieties groups and four age groups, totalling 240 strata.

13 Procedures described were used for orange. For other citrus, a simplified mapping methodology was chosen.

15.2 Fruit per tree

The average number of fruit per tree in April 2018, without considering the drop to occur throughout the season, is 564 fruit per tree.

The high number of fruit in the 2017/1018 crop in addition to unfavorable conditions caused mainly by high temperatures in October, led to a reduced fruit setting for the main bloom in regions with later flowering. More favorable conditions in the regions of Duartina, Avaré and Itapetininga triggered better flowering and fruit setting for the first bloom.

Approximately 2,200 trees were stripped of fruit. They were distributed proportionally to the total of orange trees in the citrus belt and were stratified according to region, variety and age. The random drawing employed the proportionate stratified sampling technique. For an increased estimate precision, more than 360 trees below the age of the groups in their groves were stripped. Those trees were resets planted mainly to offset losses caused HLB (huanglongbing, or greening), citrus canker and other diseases. Trees were stripped from March 15 to April 25 2018.

The average number of fruit per tree may vary by 13 fruit, plus or minus, which is equivalent to 2,3% of the average number of fruit per tree at stripping. This figure is in accordance with the expected error of 2–3% used in sizing of the sample. The yield deviation distribution analysis for each stripped tree in relation the stratum average shows that sample data is randomly distributed according to a normal distribution.

15.3 Drop rate

The estimated average drop rate is 17%. This figure is projected from the perspective of a drier year with temperatures above standard, as of October, according to information presented by the meteorological company Climatempo in April 2018. The increased severity of HLB observed in the last two years is likely to continue in this season, which accentuates the early fruit drop, even in a year of less fruit per tree.

15.4 Fruit per box

The average size is estimated at 256 fruits per box of 40.8kg. This figure is projected from the perspective described in the previous item.

In order to further support the projection for the final fruit size, a regression model was created, considering the final fruit size at harvest as the dependent variable and the number of fruits per tree at stripping; initial fruit size (fruits per box at stripping); and rainfall accumulated from May to July, as independent variables. The model used data from the last 10 crops: 2008/2009 to 2017/2018[14]. The result obtained shows an adjusted R^2 of 0.87 and an average error in the projection of fruit size of 3%. Data from this year's stripping and rainfall from May to July 2018, which was close to climatological averages (1981–2010). This was used to project the final fruit size for this season.

15.5 Objective survey method for orange crop forecast

In order to perform this forecast, the objective method used in previous seasons was maintained. This was based on quantitative data: Field measurements and the counting and weighing of fruit – applied to the direct expansion model, the formula of which follows below. The result from this equation needs to be corrected according to variables not considered in the forecast model. These include different planting densities of plots, which are not included in the stratification of groves, or the loss of trees along the season, due to eradications, abandonments or deaths. The correction factor (CF) of 0.10 is the same as is used in the 2017/1018 season.

14 Data on fruit per tree, initial and final fruit size for the series of 2008/2009 to 2014/2015 was provided by orange juice companies associated to Fundecitrus – Citrosuco, Cutrale and Louis Dreyfus, which, individually, estimated their crop for the citrus planted area since 1988, through objective methodology. Data for the 2015/2016 and 2016/2017 crops result from estimates performed by Fundecitrus.

TABLE 31: 2018/2019 orange crop forecast and its components by variety group

Variety group	Mature groves area	Average density[1]	Components of May 2018 forecast				2018/2019 orange crop forecast		
			Bearing trees	Fruit per tree at stripping[2]	Fruit estimated per box	Estimated drop rate	Per tree	Per hectare	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(number)	(fruit/box)	(%)	(boxes/tree)	(boxes/hectare)	(1,000,000 boxes)
Early season: Hamlin, Westin and Rubi	60,870	452	26,649	766	292	11.0	2.09	917	55.81
Other early season: Valencia Americana, Seleta, Pineapple	18,103	452	7,959	664	255	11.0	2.08	914	16.55
Mid season: Pera Rio	124,920	503	61,575	454	255	17.5	1.32	650	81.16
Late: Valencia e V.Folha Murcha[3]	130,637	465	59,583	560	240	20.0	1.67	764	99.80
Natal	43,893	455	19,503	603	240	20.5	1.79	797	34.97
Average	(X)	474	(X)	564	256	17.0	1.64	762	(X)
Total	**378,423**	**(X)**	**175,269**	**(X)**	**(X)**	**(X)**	**(X)**	**(X)**	**288.29**

(X) Not applicable.
1 Calculation considers the total number of trees in the plot: Bearing and non-bearing trees (2015 or 2016 resets).
2 Weighted average per total stratum fruit.
3 V.Folha Murcha – Valencia Folha Murcha.

$$\text{Production forecast} = \frac{\text{Bearing tree} \times \text{fruit per tree} \times (1 - \text{Drop rate}) \times (1 - \text{CF})}{\text{Fruit per box}}$$

The orange crop forecast and its components by variety group are shown in Table 31.

Results compiled from the inventory and the stripping of trees, obtained throughout the survey, were restricted until the date of this publication, to the following professionals: Antonio Juliano Ayres (General Manager of Fundecitrus); Fernando Alvarinho Delgado; Renato Tadeu Rovarotto and Roseli Reina (PES supervisors); Vinícius Gustavo Trombin (Executive Co-ordinator for Markestrat); Marcos Fava Neves (Political-institutional Co-ordinator linked to FEA-RP/USP and Markestrat); and José Carlos Barbosa (Co-ordinator of Methodologies linked to the Department of Math and Science of the FCAV/Unesp). All of them were subject to confidentiality obligations with regard to PES information before its announcement was made public, according to agreements signed between each of them and Fundecitrus.

All antitrust practices were complied with through the adoption of measures necessary to prevent any communication or sharing of individual information and competitive content among the orange juice companies that collaborated with Fundecitrus in this project, and between citrus growers. This team, together with Fundecitrus Chairman Lourival Carmo Monaco, concluded the crop forecast in a closed meeting on May 9 2018 at 9:30am. Next, the Fundecitrus chairman made the final information public from 10am at the auditorium at Fundecitrus, in Araraquara-SP. It was broadcast live online. A presentation of the detailed data was given by General Manager of Fundecitrus Antonio Juliano Ayres.

This executive summary was approved on May 9 2018. The full report on the tree inventory and the 2018/2019 crop forecast became available on May 21 2018 at www.fundecitrus.com.br.

Tables

The following tables present the 2018/2019 orange crop forecast by sector, age, bloom and variety. The margin of error in the production forecast for the strata is greater than the production forecast for the citrus belt as a whole. Variations that may occur in fruit size and drop rate can change the forecast. They are determined throughout the season by constant field monitoring for crop forecast updates.

TABLE 32: The 2018/2019 orange crop forecast by sector

Sector	Mature groves area	Mature groves average density[1]	Bearing trees	Fruit per tree at stripping[2]	2018/2019 Orange crop forecast		
					Per tree	Per hectare	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(number)	(boxes/tree)	(boxes/hectare)	(1,000,000 boxes)
North	85,275	470	39,323	456	1.33	612	52.19
North-west	40,139	461	18,350	314	0.92	419	16.82
Central	106,140	470	48,593	533	1.56	714	75.76
South	76,458	464	34,335	592	1.72	773	59.09
South-west	70,411	502	34,668	834	2.44	1199	84.43
Total	**378,423**	**474**	**175,269**	**564**	**1.64**	**762**	**288.29**

1 Calculation considers the total number of trees in the plot: Bearing and non-bearing trees (2015 or 2016 resets).
2 Weighted average per total stratum fruit.

TABLE 33.1: 2018/2019 orange crop forecast by tree age group (continues)

Age of plots	Mature groves area	Average density of mature groves[1]	Bearing trees by age group				Fruit per tree at stripping by age group of trees[2]			
			3–5 years	6–10 years	Over 10 years	Total	3–5 years	6–10 years	Over 10 years	Total
	(hectares)	(trees/hectare)	(1,000 trees)	(1,000 trees)	(1,000 trees)	(1,000 trees)	(fruit/tree)	(fruit/tree	(fruit/tree)	(fruit/tree)
3–5 years	37,472	636	22,996	–	–	22,996	234	–	–	234
6–10 years	123,238	540	2,202	62,780	–	64,982	107	493	–	480
Over 10 years	217,713	408	2,940	4,955	79,396	87,291	131	265	763	713
Total	**378,423**	**474**	**28,138**	**67,735**	**79,396**	**175,269**	**213**	**476**	**763**	**564**

– Represents zero.
1 Calculation considers the total number of trees in the plot, that is, bearing and non-bearing trees (2015 or 2016 resets).
2 Weighted average per total stratum fruit.

TABLE 33.2: 2018/2019 orange crop forecast by tree age group (continued)

Age of plots	2018/2019 orange crop forecast by tree age group				2018/2019 orange crop forecast by tree age group			
	3–5 years	6–10 years	Over 10 years	Total	3–5 years	6–10 years	Over 10 years	Total
	(boxes/tree)	(boxes/tree)	(boxes/tree)	(boxes/tree)	(1,000,000 tree)	(1,000,000 boxes)	(1,000,000 boxes)	(1,000,000 boxes)
3–5 years	0.69	–	–	0.69	15.82	–	–	15.82
6–10 years	0.31	1.44	–	1.40	0.68	90.32	–	91.00
Over 10 years	0.38	0.77	2.22	2.08	1.13	3.81	176.53	181.47
Total	**0.63**	**1.39**	**2.22**	**1.64**	**17.63**	**94.13**	**176.53**	**288.29**

TABLE 34: 2018/2019 orange crop forecast by bloom

Bloom	2018/2019 orange crop forecast (1,000,000 boxes)	Percentage of the orange crop forecast per bloom
1st	203.94	70.75
2nd	36.66	12.72
3rd	38.33	13.29
4th	9.36	3.25
Total	**288.29**	**100.00**

REFERENCES

A

Abras. 2010. Brazilian Association of Supermarkets.

Ackoff, R.L. *Planejamento empresarial* São Paulo: Atlas, 1980.

Achrol, R.S. *Changes in the theory of interorganizational relations in marketing: towards a network paradigm*. Academy of Marketing Science Journal. v. 25, n. 1, p. 56–71, 1997.

Almeida, M.I.R. *Manual de planejamento estratégico: desenvolvimento de um plano estratégico com a utilização de planilhas Exel.* 2. Ed. São Paulo: Atlas, 2003.

Anda (2010) Associação Nacional para Difusão de Adubos. Available at <http://www.anda.org.br>. (Accessed 17 October 2010)

Andreasen, A.R., Kotler, P. (1996). *Strategic marketing for non-profit organizations.* 5 Th ed. Upper Saddle River: Prentice Hall.

Ansoff, I. *Corporate strategy: analytic approach to business policy for growth and expansion.* New York: McGraw Hill, 1965.

Ansoff, H.I. *Estratégia empresarial.* São Paulo: Mc Graw Hill do Brasil, 1977.

Ansoff, H.I. *Do planejamento estratégico à administração estratégica.* São Paulo: Atlas, 1990.

Ansoff, H.I., McDonnell, E.J. *Implantando a administração estratégica.* 2. ed. São Paulo: Atlas, 1993.

Associação Nacional Dos Exportadores De Sucos Cítricos (CitrusBR) (2014). Available at <http://www. citrusbr.com/>. (Accessed 15 January 2014)

B

Backer, G.A. *Strategic Planning and Financial Performance in the Food Processing Sector.* Review of Agricultural Economics. V. 25, n. 2, p. 470–482, 2003.

Batalha, M.O. (org). *Gestão agroindustrial.* 2ª ed. São Paulo: Atlas, 2001. v.1, p.23–63.

Batalha, M.O., Scarpelli, M. *Gestão Agroindustrial e Tecnologia da Informação: Sugestões para uma agenda de Pesquisa.* Anais do Workshop Agrosoft – O Agronegócio da Informação. Brasília-DF, 2002.

Bateman, Thomas S. And Scott A. Snell. 2001. *Management: the new competitive landscape.* 6th ed. New York: McGraw Hill, 2004.

Barksdale, H.C., Darden, B. (1971), *Marketers – Attitude Toward the marketing Concept ,* Journal of Marketing, 35 (October), 29–36.

Boni, V., Quaresma, S.J. Aprendendo a entrevistar: como fazer entrevistas em Ciências Sociais. Revista eletrônica dos pós-graduandos em Sociologia Política da UFSC, Santa Catarina, v.2, n.1, Jan/Jul. 2005, p. 68–80. Disponível em < http://goo.gl/6lXV4>. (Accessed 25 February 2012)

Brasil. Ministério do Desenvolvimento, Indústria e Comércio Exterior. Secretaria de Comercio Exterior. Bases Estatísticas. 2013. Disponível em: <www.aliceweb.desenvolvimento.gov.br>. (Accessed January 2014)

Browning, H. *Citrus Disease Solutions Status of HLB in Florida* Citrus Research and Development Foundation In: Fundecitrus, Araraquara (São Paulo, Brazil), August 20 2015.

C

Campomar, M.C. *Contribuições ao estudo de planejamento e confecção de planos em marketing: Uma aplicação em concessionárias de automóveis.* 1982. 249p. Tese (Livre-Docência em Administração) – Faculdade de economia, Administração e Contabilidade da Universidade de São Paulo, São Paulo, Brasil.

CitrusBR. Brazilian Association of Citrus Exporters. 2010-2013.

Chiavenato, I. Teoria geral da administração. São Paulo: McGraw Hill, 1979.

Christopher, M.G. 1998. *Logistics and Supply Chain Management: Strategies for reducing costs and improving services*. London: Pitman Publishing.

Cook, M.l., Chaddad, F.R. *Agroindustrialization of the Global Agrifood Economy: Bridging Development Economics and Agribusiness Research.* Forthcoming in Agrcultural Economics. V. 23, p. 207–218, 2000.

Cooper, D.R., Shindler, P. S. *Métodos de pesquisa em administração*. 7 ed. Porto Alegre: Bookman, 2003.

Conejero, M.A. Planejamento e gestão estratégica de associações de interesse privado do agronegócio: uma contribuição empírica. 2011. 325 p. Tese (Doutorado) – Departamento de Administração, Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, Brasil.

Consoli, M.A., Neves, M. F. (2006) Estratégias para o leite no Brasil. 1a ed., São Paulo: Atlas, 291p.

Czinkota, M.R, et al. (2001). *Marketing: as melhores práticas*. Porto Alegre: Bookman. 559 p.

D

Dai, Qizhi and Kauffman, Robert J. (2002). *Business models for internet-based B2B electronic markets.* Internacional Journal of electronic Commerce, v. 6, n. 4, summer 2002, p. 41–72.

David, F.R. (2001). *Strategic Management: concept & cases* 8th ed. Upper Saddle River: Prentice Hall.

Davis, J.H. *From agriculture to agribusiness.* Harvard Business Review. V. 34, n. 1, p. 107–115, 1956.

Davis, J.H., Goldberg, R.A. *A Concept of Agribusiness.* Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1957.

Denzin, N.K., Lincoln, Y.S. 2011. *The Sage Handbook of Qualitative Research.* Thousand Oaks, CA: Sage.

F

Farina, E.M.M.Q. (2002). *Consolidation, multinationalisation, and competition in Brazil: Impacts on horticulture and dairy products systems.* Development Policy Review, v. 4, n. 20, p. 441–457.

Folkerts, H. , Koehorst, H. 1997. *Challenges in international food supply chains: Vertical co-ordination in the European agribusiness and food industries.* Supply Chain Management 2(1):11–14.

Food And Agriculture Organization Of The United Nations – FAO (2010) FAOSTAT. Disponível em:< http://faostat.fao.org/>. (Accessed 20 November 2011)

Foodnews. Agra-net. 2010. Online at: http://www.agra-net.com (Accessed: August 2013). Gripsrud, G., M. Jahre, G. Persson. 2006. *Supply chain management: back to the future?*

Frezza, B. *It is Time to examine Your Company's E-Business Model*. Internet week. Manhasset: June 22 1998.

Fundo De Defesa Da Citricultura, et al. *Citrus Tree Inventory of the São Paulo and West-Southwest of Minas Gerais Citrus Belt: Snapshot of Groves in March/2015* Araraquara, SP: Fundecitrus, 2015. 68 p.

Fundo De Defesa Da Citricultura, et al. *Citrus tree inventory of the São Paulo and West-Southwest of Minas Gerais Citrus Belt: Snapshot of Groves in March/2016* Araraquara, SP: Fundecitrus, 2016. 77 p.

Fundo De Defesa Da Citricultura, et al. *Final orange production estimate for the 2015–2016 season of the São Paulo and West-Southwest Minas Gerais: April forecast*. Araraquara,SP : Fundecitrus, 2016. 2 p.

Fundo De Defesa Da Citricultura, et al. *Orange production forecast for the 2016–2017 season of the São Paulo and West-Southwest Minas Gerais: May forecast.* Araraquara,SP: Fundecitrus, 2016. 25 p.

G

Goldberg, R.A. (1968) *Agribusiness co-ordination: A system approach to wheat, soybean and Florida orange economies.* Division of Research, Graduate School of Business and Administration, Harvard University, 256p.

Grant, R.M. *Contemporary strategy analysis: concepts, techniques, applications.* 4. ed. USA: Blackwell Publishers, 2002.

H

Hair, Jr. J.F., Babin, B., Money, A.H., Samouel, P. *Fundamentos de métodos de pesquisa em administração.* Tradução Lene Belon Ribeiro. Porto Alegre: Bookman, 2005. P. 471. Título original: Essentials of Business Research Methods.

Hamel, G., Prahalad, C.K. *Competindo pelo futuro: estratégias inovadoras para obter o controle do seu setor e criar mercados de amanhã.* Rio de Janeiro: Campus, 1997.

Hardman, P.A., Darroch, M.A.G., Ortmann, G.F., (2002) *Improving co-operation to make the South African fresh apple export value chain more competitive*. Journal on Chain and Network Science, 2(1):61–72.

Harper, Jr., M. 1961. *A New Profession to Aid Management.* Journal of Marketing 25(3):1–6.

Hax, A.C., Majluf, N.S. (1991). *The Strategy Concepts & Process – a Pragmatic Approach.* New Jersey. Prentice Hall.

Hax, A.C., Majluf, N.S. *The strategy concept and process: a pragmatic approach.* E ed. New Jersey: Prentice Hall, 1996.

Heleno, G. *As oportunidades do Brasil rural.* In: Revista Brasileira de Administração. Ano XIX, n° 70. Mai./Jun. de 2009.

I

Instituto Brasileiro De Geográfia E Estatística – IBGE, 2007. Censo Agropecuário 2006. Disponível em: <http://www.sidra.ibge.gov.br/bda/acervo/acervo2.asp?e=v&p=CA&z=t&o=11>. Acesso em: out. de 2012.

Instituto Brasileiro De Geográfia E Estatística – IBGE, 2011. Produção Agrícola Municipal 2010.Disponível em: <http://www.sidra.ibge.gov.br/bda/acervo/acervo2.asp?e=v&p=PA&z=t&o=11>. Acesso em: out. de 2012.

J

Jain, S.C. *Marketing planning & strategy.* 6th ed. Cincinnati: Thomson Learning, 2000.

K

Kalaki, R.B. *Uma proposta de plano estratégico para o setor citrícola brasileiro.* 2014. 186 p. Dissertação (Mestrado) – Departamento de Administração, Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, Brasil.

Kaplan, R.S., Norton, D.P. *Organização orientada para a estratégia: como as empresas que adotam o Balanced Scorecard prosperam no novo ambiente de negócios.* Rio de Janeiro: Campus, 2001.

King, G., Keohane, R.O., Verba, S. 1991. *Designing Social Inquiry: Scientific Inference in Qualitative Research.* Princeton: Princeton University Press.

King, R.P. et al. *Agribusiness economics and management*. American Journal of Agricultural Economics. v. 92. n. 2. p. 554–570, April 2010.

Klueber, R. (2000). *Business model design and implementation for e-services*. Americas Conference on Information Systems, p. 797–800.

Kohli, A., Jaworski, B.J. (1990), *Market Orientation: The Construct, Research Propositions, and Managerial Implication*s, Journal of Marketing, 54 (April), 1–18.

Kotler, P. (1996). *Administração de Marketing: análise, planejamento, implementação e controle.* 4ª ed. São Paulo: Atlas.

Kvale, S., Brinkmann, S. 2009. *InterViews. Learning the Craft of Qualitative Research Interviewing.* Second Edition. Thousand Oaks: Sage Publications.

Kotler, P. *Administração de marketing – análise, planejamento, implementação e controle.* São Paulo: Prentice Hall, 2000. 725p.

L

Lambin, J.J. *Marketing estratégico.* 4 ed. Lisboa: McGraw Hill, 2000. 756p.

Lambin, J.J. *Market-driven management: Strategic and operational marketing*. United Kingdom: Palgrave Macmillan, 2012.

Las Casas, A.L. *Plano de marketing para micro e pequena empresa*. São Paulo: Atlas, 1999. 156p.

Lazzarini, S.G., Chaddad, F., Cook, M.L. *Integrating supply chain and network analysis: the study of netchains.* Journal on Chain and Network Science. V. 1, n.1, p. 7-22, 2001.

Lazzarini, S.G. *Estudos de caso para fins de pesquisa: aplicabilidade e limitações do método.* In: FARINA et al. (Coord). Estudo de caso em Agribusiness. São Paulo: Edtora Pioneira, 1997. p 9–13.

Lechner, U., Hummel, J. (2002). *Business models and system architectures of virtual communities: from a sociological phenomenon to peer-to-peer architectures.* International Journal of Electronic Commerce, v. 6, n. 3, p. 41–53.

Lovelock, C.H. (1996). *Services Marketing.* New Jersey: Prentice Hall.

Luhmann, N. 2009. *Introdução à Teoria dos Sistemas*. Petrópolis: Vozes.

M

Mahajan, V., Banga, K. (2006). *The 86 percent solution*. Upper Saddle River, NJ: Wharton School.

Malhotra, N.K. (2001) *Pesquisa de marketing: uma orientação aplicada.* 3. ed. Porto Alegre: Bookman.

Markestrat *Centro de Pesquisa e Projetos em Marketing e Estratégia.* Available at < http://markestrat. org/>. (Accessed 10 October 2014)

Mattar, F.N. (1993) *Pesquisa de Marketing*. São Paulo: Atlas.

Mbagro Consultoria. *Metodologia de cálculo do modelo de parametrização e de divisão de riscos e retorno da cadeia citrícola brasileira*. Brasília, novembro de 2012. Disponível em: <http://www.agricultura.gov.br/arq_editor/file/camaras_setoriais/Citricultura/34RO/App_Concecitrus_Citrus.pdf>. (Accessed September 2013)

McCarthy, E.J., Perreault, W.D. Jr. (1984), *Basic Marketing*, 8th ed. Homewood, Il: Richard D. Irwin. Inc.

McCarthy, E.J., Perreault, W.D. Jr. (1997). *Marketing Essencial: Uma abordagem gerencial e global*. São Paulo: Atlas.

McNamara, Carlton P. (1972), *The Present Status of the Marketing Concept*. Journal of Marketing, 36 (January), 50–7.

Ménard, C. 2002. *The Economics of Hybrid Organizations*. Pantheon-Sorbonne: University of Paris.

Miles, M.P., White, J., Munilla, L.S. *Strategic planning and agribusiness: An exploratory study of the adoption of strategic planning techniques by co-operatives*. British Food Journal. v. 99, n. 11, p. 401–408, 1997.

Monteiro, et al. *The role of empirical research in the study of complex forms of governance in agroindustrial systems.* Revista de Economia e Sociologia Rural. v. 50, n. 4, p. 667–682, 2013.

Morvan, Y. (1985) *Filière de Production* in Fondaments d'economie industrielle, Economica, 199–231.

N

Neves, M.F. 2013. *ChainPlan: A method for demand-driven strategic planning and management of food chains.* Enfoque general sobremetodología de la cadena de valor alimentaria, edited by JúlianBriz and Isabel Felipe, p. 61–78, Madrid: Editorial Agrícola Española.

Neves, M.F., Trobin, V.G. 2011. *The Orange Juice Business: A Brazilian Perspective.* Wageningen: Wageningen Academic.

Neves, M.F. (2005). *Planejamento e gestão Estratégica de Marketing.* São Paulo: Editora Altas.

Neves, M.F., Oliveira, M.A. De. (2007). *Ações de comunicação em organizações do agronegócio. XIV Congresso da Sociedade Brasileira de Economia, Administração e Sociologia Rural.* Londrina, Paraná.

Neves, M.F. et al II. (2010). *O Retrato da citricultura brasileira.* São Paulo: CitrusBR.

Neves, M.F. et al II. (2011). *The orange juice business.* Wageningen: Wageningen Academic Publishers.

Neves, M.F. (2007). *A Method for demand-driven strategic planning and management for food chains (The Chain Plan Method).* 17th Annual World Forum and Symposium – Food Culture: Tradition, Innovation and Trust – A Positive Force for Modern Agribusiness, 2007, Parma, Italy: June.

Neves, M.F., Rossi, R.M., Castro, L.T., Lopes. F.F., Marino, M.K. (2004) *A framework for mapping and quantifying value chains towards collective actions.* European Marketing Academy, Murcia. International Food Agribusiness Management Association, Montroeux.

Neves, M.F., Lopes, F.F. (2005) *Estratégias para laranja no Brasil*. 1. ed. São Paulo: Atlas, 224 p.

Neves, M.F., Trombin, V.G. (2011) (Coord.). *The orange juice business: A Brazilian perspective.* Holanda: Wageningen Academic Publishers. 176p.

Neves, M.F., Trombin, V.G., Consoli, A.M. (2010) *Mapping and Quantification of the sugar-energy sector in Brazil.* Proceedings of 2010 IAMA (International Food And Agribusiness Management Association) World Symposium & Forum, 2010, Boston, MA, USA.

Neves, M.F., Trombin, V.G., Barbosa, J.C., Ayres, A.J. *The new method of citrus forecast in Brazil.* Fruit Processing, Rengsdorf, v.26, n.1, p. 6–10, 2016.

Netto, I. *With our feet on the ground*. CitrusBR, São Paulo, October, n.6, p.36–54, 2015.

Neves, M.F. *Uma proposta de Modelo para o planejamento e gestão estratégica de marketing nas organizações.* 2004. 295p. Tese (Livre-Docência) – Departamento de Administração, Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto.

Neves, M.F. *Planejamento e gestão Estratégica de Marketing.* São Paulo: Editora Altas, 2005.

Neves, M.F., Lopes, F.F. (Org.). *Estratégias para a laranja no Brasil.* São Paulo: Atlas, 2005. p. 232.

Neves, M.F. *Planejamento e gestão estratégica de cadeias produtivas visando a competitividade: aplicações nos agronegócios.* 2007**.** Disponível em: < http://www.favaneves.org/arquivos/gecad.pdf>. (Accessed 3 March 2013)

Neves, M.F. et al. *Caminhos para a citricultura: uma agenda para manter a liderança mundial.* São Paulo: Atlas, 2007.

Neves, M.F., Oliveira, M.A. De. *Ações de comunicação em organizações do agronegócio.* XIV Congresso da Sociedade Brasileira de Economia, Administração e Sociologia Rural. Londrina, Paraná, 2007.

Neves, M.F. *Método para planejamento e gestão estratégica de sistemas agro-industriais (GESis)*. São Paulo: RAUSP, Revista de Administração da Universidade de São Paulo. V. 43, n. 4, outubro/novembro/dezembro de 2008.

Neves, M.F., Trombin, V.G., Cônsoli, M.A. *O mapa sucroenergético do Brasil.* In: Souza, E.L.L. de., Macedo, I.C. (Org.) Etanol e bioeletricidade: a cana de açúcar no futuro da matriz energética. São Paulo: Luc Projetos de Comunicação, 2010. p. 15–43.

Neves, M.F. et al. *O Retrato da citricultura brasileira.* São Paulo: CitrusBR, 2010.

Neves, M.F., Trombin, V.G. *Análise de uma década da laranja.* Position Paper. Ribeirão Preto: Markestrat, 2011.

Neves, M.F. (Coord.). *Estratégias para a carne bovina no Brasil.* São Paulo: Atlas, 2012. p. 272.

Neves, M.F., Pinto, M.J.A. (Org.). *Estratégias para o algodão no Brasil.* São Paulo: Atlas, 2012. p. 118.

Neves, M.F. et al. *A laranja do campo ao copo.* São Paulo: Atlas, 2012a.

Neves, M.F., Trombin, V.G., Kalaki, R.B., Lopes, F.F. *Competitiveness of the Orange Juice Chain in Brazil.* IAMA 22nd Annual World Food and Agribusiness Forum and Symposium The Road to 2050: "The China Factor", 2012, Shangai. international Food and Agribusiness Management Association (IFAMA), 2012b. v. 22.

Neves, M.F., Trombin, V.G. (coord.) *A dimensão do setor sucroenergético: mapeamento e quantificação da safra 2013/14*. Ribeirão Preto: Markestrat, 2014.

O

Oliveira, D.P.R. *Planejamento Estratégico: Conceitos, Metodologia e Práticas*. 6 ed. São Paulo: Atlas, 2006.

Oliveira, M.M. Como fazer pesquisa qualitativa. Petrópolis: Vozes, 2007.

Omta, O., Trienekens, J.H., and Beers, G. 2001. *Chain and network science: a research framework.* Journal on Chain and Network Science 1(1):1–6.

Omta, O., Trienekens, J.H., and Beers, G. 2001. *The knowledge domain of chain and network science.* Journal on Chain and Network Science 1(2): 77–85.

P

Pearce, J.A., Robinson, R.B. *Strategic Management: formulation, implementation and control*. 9. ed, McGraw Hill, 2005.

Pinto, G., Maresca, J. 2012. Global project to increase the consumption of orange juice. In: The Model of Consecitrus. São Paulo: CitrusBR and SRB, 10–11.

Prahalad, C.K. (2005). *The fortune at the bottom of the pyramid*, Upper Saddle River, NJ: Wharton School.

Porter, M.E. (1989). *Competitive strategy: Techniques for analysing industries and competitors*. New York: Free Press.

R

Reardon, T., Barrett, C.B., Berdegué, J.A., Johan, Swinnen, F.M. 2009. *Agrifood Industry Transformation and Small Farmers in Developing Countries*. World Development 37(11):1717–1727.

Rossi, R., Neves, M.F. (2004) *Estratégias para o trigo no Brasil*. 1. ed. São Paulo: Editora Atlas, 224p.

S

SECEX/MDIC. Brazilian Department of Foreign Trade in the Ministry of Development, Industry and Foreign Trade. Statistics bases. Online at: www.aliceweb.desenvolvimento.gov.br (Accessed: August 2013).

Selltiz, C. et al. *Métodos de pesquisa nas relações sociais.* São Paulo: Herder, 1967.

Shepherd, A.W. 2007. *Approaches to linking producers to markets: A review of experiences to date.* Rome: Food and Agriculture Organization of the United Nations. Online at: ftp://ftp.fao.org/docrep/fao/010/a1123e/a1123e00.pdf.

Sheth, J.N. (2011). *Impact of Emerging Markets on Marketing: Rethinking Existing Perspectives and Practices.* Journal of Marketing: Vol. 75, No. 4, pp. 166–182.

Sheth, J.N., Mittal, B, (1996). *A framework for managing customer expectations.* Journal of Market-Focused Management, 1 (2), 137–58.

Shimp, T. (2002). *Propaganda e Promoção.* 5a. Ed. Porto Alegre: Bookman.

Silva, A.L. da, Batalha, M.O. (2001) *Marketing estratégico aplicado ao agronegócio.* Batalha, M.O. (org) (2001) Gestão agroindustrial. 2ª ed. São Paulo: Atlas, 1:23–63.

Silva, A.L. Da, Batalha, M.O. *Marketing estratégico aplicado ao agronegócio*. Batalha, M.O. (Coord.) Gestão Agroindustrial. 3 ed. Vol 1. São Paulo: Atlas, 2010. p. 113–183.

Silva, R.T.P., Barcelos, J.J., Falchetti, S. *A. estudo da aplicação do planejamento estratégico para atividades pecuária bovina de cria, recria e engorda: um estudo de caso – Fazenda Santa Maria da Amazônia.* In: Simpósio de Administração da Produção, Logística e operações Internacionais, 13, São Paulo, 2010.

Sindag (2010) Sindicato Nacional da Indústria de Produtos para Defesa Vegetal. Available at <http:// mdic.gov.br> (Accessed 7 Oct. 2010)

Sonka, S.T., Hudson, M.A. 1989. *Why agribusiness anyway?* Agribusiness 5(4): 305–314. Stevens, G.C. 1989. Integrating the Supply Chain. International Journal of Physical Distribution & Logistics Management 19(8): 3–8.

Soriano, R.L., Torres, M.J.M., Rosaleñ, R.C. Methodology for sustainability, strategic planning and management. Industrial Management & Data Systems. V. 110, n. 2, p. 249–268, 2010.

Stych, M. 2010. *Power shift in FMCG: How retailers are in control and what suppliers can do about it.* London: Planet Retail Limited.

Stern, L.W., El-Ansary A.I. Coughlan, A.T. (1996). *Marketing channels.* 5 ed. Englewood Cliffs: Prentice Hall.

T

Tetra Pak. 2010–2013.Worldwide Center for Research and Development and Business Intelligence. Modena, Italy. Internal database.

Tetra Pak. Beverages Global Market. 2014.

U

USDA (2010) United States Department of Agriculture. Accessed http://www.usda.gov (Accessed 9 July 2010).

USDA. United States Department of Agriculture. PSD Online. Online at: http://www.fas.usda. gov/psdonline/psdQuery.aspx. (Accessed August 2013).

United States. U.S. Department of Agriculture. PSD Online. Disponível em: <http://www.fas.usda.gov/psdonline/psdQuery.aspx> (Accessed 21 January 2015)

USDA, National Agricultural Statistics Service. *Citrus production forecast for the 2015–2016 season of Florida: May forecast.* Maitland, FL: USDA, 2016. 3 p. Available at <https://www.nass.usda.gov>. (Accessed May 10 2016)

V

Vieira, V.A., Tibola, F. *Pesquisa qualitativa em marketing e suas variações: trilhas para pesquisas futuras.* P. 09–33. Curitiba: Revista de Administração Contemporânea – RAC. V. 9, n. 2, abr./jun., 2005.

Vilella, F. et al. (2009) *El sistema de Agronegocios de la Soja en Argentina, su cadena y prospectiva al 2020.* Bayer, ACSOJa, Programa de Agronegocios y Alimentos, Facultad de Agronomía, Universidad de Buenos Aires.

Viscio, A.J., Pasternack, B.A. (1999). *Toward a New Business Model*. Available in: http://www.strategybusiness.com/research/96201/page1.html (Accessed 4 November 2012.

W

Westwood, J.O. *Plano de marketing.* São Paulo: Makron Books, 1995. 256p.

Wind, J.Y. *How to reinvent marketing.* Sloan Management Review, Summer, 2008.

Wind, J.Y. (2009). *Rethinking marketing: Peter Drucker's challenge.* Journal of the Academy of Marketing Science, 37(1), pp 28–34.

Wood, M.B. *Marketing planning: Principles into practice.* Harlow: Prentice Hall, 2004. 379p.

Wright, P., Kroll, M.K., Parnell, J. *Administração estratégica: Conceito.* Tradução: Celso A. Rimoli e Lenita R. esteves. São Paulo: Atlas, 2000. 433p.

Zylberstajn, D. 1995. *Estruturas de Governança e Coordenaçãodo Agribusiness: Uma Aplicação da Nova Economia das Instituições.* 238. Tese (Livre-Docência) – Departamento de Administração, Faculdade de Economia, Administração e Contabilidade, Universidade de São Paulo, São Paulo.

Zylbersztajn, D. *Conceitos gerais, evolução e apresentação do sistema agroindustrial.* In: Zylbersztajn, D., Neves, M.F. (org.) Economia e gestão dos negócios agroalimentares. São Paulo: Pioneira, 2000. P.1–21.

Zylbersztajn, D., Neves, M.F. (org.) (2000) *Economia e gestão de negócios agroalimentares.* São Paulo: Pioneira, 428p.

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Recognized as the most prolific Brazilian academic with the largest number of international publications about the orange juice and sugar cane chain, and one of the most cited Brazilian authors in the area of food and agribusiness, his work strongly focuses on supplying simple and effective methods for business. He has published more than 100 articles in international journals and has been author and editor of 63 books by 10 different publishers, globally. He is also one of the most active Brazilian speakers, having given more than 1 050 lectures and presentations in 25 countries, and has received around 150 recognitions from Brazilian and international organizations.

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