The Sugar League: Restructuring of the Sugar Supply Channel for the Processed Food Network

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1. Introduction

Supply chain management has been increasingly recognized as an important factor to be taken into account in company strategies. Faster and cheaper products and services for customers than those of the competition motivate managers to engage in joint actions with organizations up- and downstream from their companies. The objective of this articulation is to create the conditions the company needs to gain a larger value margin for its products, either through reduced costs or through differentiation. This challenge is even more relevant in the processed food chain owing to the high percentage of logistic costs in relation to the products’ sales prices. Another particularly important challenge in this chain is to create the capacity to continually launch new products to offset the growing trend for loss of loyalty to brands.

The volatility of the demand for food products is enhanced by constant product innovations, coupled to new concepts presented in the international markets. These innovations are directed by transnational companies that have established manufacturing units in Brazil following the opening of the market and the stabilization of Brazil’s economy.

This study analyzes the restructuring of the sugar supply channels for food production. Our analysis is based on the concept of company networks and how they function to integrate supply operations among each other. The dynamics of structural transformation of company networks is explained by technological conditioning factors. After a presentation of this theoretical picture, the situation of the Brazilian food market vis-à-vis the globalized economy is discussed. A report is then made of the results of our observations based on field surveys of the initiatives of sugar mills that resulted in the restructuring of the sugar supply to the industrial market following the deregulation of the sugar and alcohol sector. We conclude this article by indicating the three main determining factors of this restructuring process.

The findings on which this analysis is based were obtained through multi-case studies considering five pairs of companies (sugar mill and buyer) that engage in the business of supplying sugar as an intermediate product. This survey was carried out for the author’s doctoral thesis.

2. Company Networks

The company’s productive capacity for efficient production and logistic processes has been declared by Skinner, since the 1960s, as being the basis of its corporate strategy. This author highlighted the skills related to product quality and cost, speed, and the consistent performance and flexibility of delivery processes and productive systems as the company’s competitive factors (Skinner, 1969). The literature on production
management formalizes the pursuit of these skills with studies on manufacturing strategy, including the dimension of innovation (of products and process) (Slack, 1997).

Porter (1990) elaborates on the need pointed out by Skinner by proposing an analysis of the company’s chain of values. He states the need to understand the company’s value activities¹ and how the company relates to its business partners up- and downstream as the premise to achieve and maintain competitive advantages. Thus, the scope of the company’s influence extends beyond its boundaries, with interrelated activities added to the processes of placing its product in the market or of purchasing raw materials. Reflections on the search for the company’s competitive advantage associated to the other business processes led to the concept of supply chain management (Cooper et al., 1997).

The basic principle governing supply chain management (SCM) is to ensure greater visibility² of the events related to the satisfaction of demand, be it to meet demand by increasing the efficiency of the existing product flow or by effectively responding to expectations regarding new products. Synchronization between the physical flow of products and the flow of information regarding market needs is the greatest challenge for managers. This visibility offers improved conditions for reduced stocks of intermediary products, raw materials, products for industrial processing and end products (Bowersox & Closs, 1996; Christopher, 1997). The paradigmatic change caused by the adoption of this concept is that of speeding up the supply of requirements through the use of information, as opposed to that of anticipating stocks to meet the demand. Visibility about opportunities for product differentiation feeds the activity of technological management for its creation and development.

In face of the impossibility of controlling end demand, particularly of foods, the companies participating directly or indirectly in the production and distribution of a product organize themselves into networks to absorb the fluctuations between product demand and offer. Proximity to the end market is closer when information is shared with companies downstream about what is happening in the consumer environment. The cycle of new product development is reduced by the establishment of relationships with suppliers. This is the concept of tense flow management used by Green & Santos (1991)). This concept emerges with the facilities offered by the technology of information and communication (TI) which accelerates data collection and assessment and the production of knowledge through its use. However, these facilitators are insufficient to cope with the complexity of managing the different values and interests of the companies that participate in a business network.

2.1 Management of the supply chain

Slack et al. (1997) present the structure of a company’s supply chain as comprising all the companies responsible for the physical constitution of the products offered to its buyers, separating the activities that support the flow of the supply chain. These authors are concerned with the development of capacities to meet the goals of operational strategies, i.e., cost, quality, consistent production and delivery performance, innovation, flexibility in production and in meeting customer orders. They detail forms of management of the company’s value activities as defined by Porter, who states that the company’s value activities are those that differ physically and technologically and are necessary to create value for its customers.

Cooper et al. (1997) broaden the scope of analysis for supply chain management, proposing a methodology that considers three interrelated elements: business processes, management components and supply chain structure, and responding to the concerns of the authors cited earlier herein by presenting a model for supply chain management. Business processes focus on customer service. The components of management are associated to decision-making processes about the actions that take place in the supply chain. The Supply Chain structure is composed of the physical distribution channels of its products as well as the supply channels of its raw materials. The flow of materials and of information passes through this structure, composed of the technological sets of the participating companies. The technological resources that support the business processes among companies limit the possibilities of the levels of efficiency and effectiveness of the information and physical flows.

¹ Porter considers the company’s value activities as those that are physically and technologically different, necessary to the creation of value for its customers.
² The concept of visibility is dealt with by Christopher (1997) and corresponds to the company’s capacity to know what the expected demand and the need for stocks throughout the chain is for fast and reliable supply.
The proximity of suppliers can reduce stocks of raw materials for production. Greater frequency of material and component replacement can be achieved by organizing the joint collection of what is needed. The milk-run process establishes the concentration of transportation of the materials required for a given buyer, which are collected at several suppliers. The dynamics of supply channel restructuring has been oriented toward the concentration of raw materials, with a reduced number of suppliers and/or transactions among companies. In this case there is also co-production, with the anticipation of production phases that had previously been internal at the buyers. These facilities exert the function of concentrating components of lower added value than assembled products. This work reveals changes in this direction that occur in chains of companies with continuous processes.

The TI (technology of information and telecommunication) structure is part of the chain’s structure. The type of information passed around among the members of the supply chain and the frequency of information updating strongly influence the performance of their flow. The distribution of information must ensure communication, substantial content; it must be fast and move from point to point, guaranteeing visibility throughout the productive chain for all its members. These requisites reflect the change in the organizational structure. Instead of hierarchical and sequential decisions handed down through functions, process management requires that information be connected to objects of analysis (buyer, product, sales force, equipment, processes) so as to personalize reports to support group work around the business process. The flow of information facilitated by the TI structure, as observed earlier, is insufficient for the generation and use of knowledge among companies, since it is dependent on the organizational structure that coordinates the joint efforts among those companies.

2.2 Changes in the supply chain

As pointed out by Cooper and others and illustrated above, the three elements considered in supply chain management are interlinked and a change in one of these elements leads to the reorganization of the others. Business processes interfere in the constitution of the supply chain by proposing technological changes to support the flows in their structure of changes in the management components for the functioning of their flows. The management components potentiate the use of the network’s structure for the success of the business processes. The goal of the dynamics determined by the integration of the three elements is to achieve the chain’s superior performance in relation to the competition.

Lundgren reproduces a model, originally presented in Hakansson (1997: apud Lundgren, 1995), in which a network of companies is represented by the composition of two basic sets that express the interorganizational connections. These are an institutional set (the coordination of exchanges between production and consumption systems) and a technological set (constituted of the production systems, linking resources and activities according to the industrial logic that defines the nature of production and consumer activities, knowledge of product technology, production methods and natural resources). He states that the forms of network coordination, as well as the standards of behavior among its actors, affect the possibilities for changes in the technological system and vice-versa. Lundgren points to technological innovation as the main factor responsible for changes in its structure, also interfering in the constitution of the institutional set on which the coordination of business processes is founded. He sees technological development in company networks as an interactive and cumulative process guided by the search for the solution of problems resulting from joint actions among the companies. The interaction among actors in the network is aimed at inducing and conducting innovations for the improvement of the entire network.

3. The productive sugar chain and the supply network of industrially processed food

The situation of the international sugar market in the 1990s differs greatly from that of the twenty preceding years, when the sugar and alcohol sector was supported by Brazil’s federal Proalcohol program. It was a market dominated 90% by the trade of raw sugar, i.e., non-processed centrifugalized sugar, against the 10% corresponding to centrifugalized white sugar, processed and non-refined. It was in this market context that substitutes emerged, such as corn isoglucose or HFSC (High Fructose Corn Syrup, a corn syrup with a high fructose content) and other natural and synthetic sweeteners that began to compete in the market with sugarcane- and beet-derived sugar (Veiga Filho, 1998). By the end of the 80s this situation began to undergo pressures to change. Despite continuing protectionism in some domestic markets, the liberalization of world
trade affects the international sugar trade, the protectionist policies 3, the internal market and the relationships of sugar mills with their buyers, principally those of the industrial market. The external prospects are of intensified competition between the sugar producers of industrialized nations and developing countries. Cane sugar is losing ground to sweeteners in the industrialized countries. On the other hand, an accelerated growth is observed in the business of economic interblocks (NAFTA and the EU market) among the large regional corporations of the sectors of primary processing of agricultural products and the food industry. These businesses lead to a marked process of vertical integration between the food industry in developed countries and the agroindustry in emerging countries, with a growing focus on the economy of operations (LMC, 1999) and guided by advances in biotechnological research.

Szmrecsányi (1993) expands the markets in which the sugar agroindustry is inserted beyond those in which its main direct product, sugar, is made available. Sugar serves as an intermediary product in technologically more complex processes such as the production of citric acid (by a biotechnological basis) or for composition with other raw materials for supply to the industry of consumer goods.

3.1 Processed food supply networks

The large transnational conglomerates of the food industry establish Brazilian units for production and distribution. Competitor networks are defined for action in the Brazilian market. These networks operate within a new competitive pattern characterized by tense flow and by the integrated management of its raw materials supply and the physical distribution of its products.

This efficiency is even more urgent when one observes that the competition among the local food production units follow the worldwide pattern of competitiveness and must go along with the technological standards of their international peers. The food producing companies, on the other hand, are pressured by the retailers, who have also changed their forms of actuation, mainly by the economy of its operations. Silva highlights the tendency for power changes in the food product supply channel (Silva, 1999), retailers have gained the position of market conductors and have strengthened their position in the supply network of the products they offer to the end consumer.

In face of two facts – intensified competition among the companies of the food industry and the pressure for widespread distribution to increase the operational efficiency of the supply of products to the retail market, the companies in the food industry find themselves forced to lower the cost of their products, accelerate their customer service cycles and make ongoing product innovations.

3.2 A radical change in the concept of food product development: the complete bases

The diversity of food processes has increased due to the globalization of markets and the constant changes in concepts about food. Today the “Pão de Queijo Mineiro” is consumed in Japan and the “Kani kawa” already participates in Brazilian consumption. New concepts are extracted from basic research, whether it is biotechnological or from molecular medicine, allowing for continuous innovations in food products and narrowing their life cycle.

The value of practicality has also become increasingly important. Given the change in the role of women in society, fast preparation of foods, longer conservation times, easy adaptation to different needs and differentiation of ready or semi-prepared foods have become increasingly necessary factors. Moreover, the diversity of new products seeks to meet a variety of conveniences: for babies, for the elderly, energetic, with added vitamins, vegetable juices, etc. A new concept has emerged to cope with the growing need for product innovation: that of complete bases or compounds 4. Compounds are mixtures of ingredients such as juices, aromas, food dyes, acidulants, emulsions, extracts, and additives, among others. They are formulated to present given characteristics that meet the needs of the food and beverage industry. Compounds for the beverage industry may contain vitamins, minerals, energetic ingredients, fibers and others. Liquid and invert sugars are important means for the incorporation of compounds.

3 It is interesting to note that deregulation occurs in most developed countries, although there is still strong protectionism in Europe and the USA as a way to defend the interests of its beet, corn and sugar cane producers.

4 Information about compounding was obtained from internet websites on the companies that work with compounding (Corn Products International, Cargill, National Starch, etc.) and from technical magazines about food processing.
Compounds facilitate the development of new products because the use of compounding contributes toward the acceleration of the order processing cycle by reducing the food production time. The modified raw materials – components of the compounds, increase the flexibility, productivity and consistency of the performance of productive processes, with the resulting reduction of operational costs, and permit the food industry network to function in a tense flow. The potentiation of the stabilization characteristics of some basic ingredients in the ingredient industry, such as yeast, for example, allow for greater control of the volume to be worked on in different stages of food production. In breadmaking, other ingredients used in the dough facilitate its densification, improving the texture of baked products. In the production of cookies, these ingredients preclude the need for mold baking. The production of candies was greatly favored by the solution to a recurring problem that frequently caused production stoppages during wrapping. The use of a modified ingredient mixed with sugar facilitates uniformity in the formation and production of candies. These modified ingredients also ensure the standardization of different production lots that use seasonal raw materials. Fruit pulp containing these ingredients, for instance, remains fresh for longer periods. Greater process stability and uniformity of component materials and products are ensured.

The compounding industry supplies pre-developed products that are easily applicable when in synergy with the buyer’s production plant. The company willing to work with compounding must invest in equipment and its adoption is therefore dependent on a strategic decision. Adoption of compounding must also take into account the market in which it will act, its distribution, its positioning, the target public to be explored and the investments in marketing to be directed at the new product. In addition to product development, compound processors offer their users/customers technical support and other service variables. Supply logistics are simplified by the concentration of several ingredients in a single product, reducing the number of transactions between supplier and buyer.

This industrial segment may substitute ingredient distributors (aromas, essences, food preservers, etc.) and raw material suppliers (sugar, flour, cocoa, etc.) and constitutes the segment of complete bases – compounds – for the food industry. This participator in the food chain has the function of concentrating these raw materials, distributing them to its industrial buyers in customized form since it develops new products according to desired specifications.

Within this context, the demand for professionalism in the supply of sugar required by the food industry was far from being achieved, even with the efforts of some sugar mills to develop competencies in this field. The issue lies in the capacitation in technological management of biotechnological processes.

4. Restructuring of the sugar supply channels to the food chain

With the entry into the Brazilian market of global corporations of the food sector, changes have been wrought in the structure of the competition among them and with companies downstream in the distribution channels.

There is growing product innovation and, at their local operating units, food-processing corporations must develop technological capacitation to adapt their new products to the Brazilian palate. Furthermore, biotechnology makes new modified products available that, incorporated to the processed food production processes, lead to enhanced uniformity and faster production and extended product lifetime.

Thus, sugar is required by the industrial market according to standards and specifications established by new production processes. From direct raw material to the food industry – when its purchase used to be solely based on price, today – through a process of aggregated value, it has become an intermediary product passed on to its buyers through technical sales. Services are added to sugar to ensure its quality and conformity to the specifications of the food recipes in which it is to be used.

The initiatives of the sugar mills to go along with these changes and position themselves in the industrial market are directed at the search for logistical and commercial competence. The mills set up commercial directorships, with sales managers, support for logistic activities and customer service. This structure also serves the export and retail markets. Most mills sell their sugar to the international markets through trading companies that already act in the international market. Few set up their own port terminals, preferring to associate themselves to trading companies.

Although it is a new intermediary raw material, sugar in the form of sweetener changes its form, becoming liquid and invert sugar. Although the technology has already existed for some time, it used to be
monopolized by the Dedini group. The Usina São Luiz, which has produced invert sugar since the 70s, installed two liquid sugar plants in the second half of the 90s, when the Barra, Nova América, Guarani and Copersucar mills also made technological expansions in their activities. They diversify their activities to differentiate their products, investing in industrial processes to refine and liquefy sugar, producing liquid or invert sugar to obtain syrup composed of glucose, fructose and saccharose. The Nova América mill stands out from the others by seeking capacitation for the technical sales of its products.

The liquid and invert sugars, by anticipating the syrup activity, involve one phase less, the first, in the industrial soft drink production process, and one phase less, the last one, in the production of candies, sweets, cookies, juices and crystallized fruit. By offering a ready to use product, it simplifies and standardizes the industrial processes that use these products, facilitating their operation and control, besides eliminating packaging (bags) handling problems. Thus, it offers advantages to its buyers, enabling them to increase their productivity, reduce energy-related losses and labor, and make better use of their space, which had previously been used to store sugar bags.

However, the strongest actions toward diversification of the sugar mills in marketing areas, with capacitation for technical sales of new products for the industrial market have come about through the association with companies that have been acting more broadly in the market of ingredients for food production since 1998, when the sector went through a serious crisis caused by superproduction.

Dedini Açúcar Líquido entered into a joint venture with a company with Irish held capital called Circlet, a member of a group that also acts in the food sector. The liquid and invert sugar producing units were disassociated from the Dedini group and managed separately, supplying invert sugar to the juice, candy, sweets, and dairy industries and liquid sugar to the beverage industry.

Sugar has become a new intermediary raw material for the food industry through a biotechnological process for the production of acidulants and preservers.

The most direct action observed in this direction is the incorporation of Fermenta (the former Usina de Santa Rosa do Viterbo) by Tate&Lile with the formation of Mercocitrus. Thus, the global Tate&Lile chain, through its local unit, supplies acidulants to its buyers, who are the global corporations of the food industry that now also have local operating units.

This last transformation was made possible by the new fermentation biotechnology, in which sugar is transformed into acidulants, substituting products that originated from the chemical industry and which confer improved characteristics to the end products of the food industry in regard to preservation and easy production. In addition to the advantage of being considered “organic” products, sugar-derived acidulants have stabilizing characteristics in industrial processes and preserver in food products. The transformation of sugar into acidulants had already been done by a conventional process by Fermenta, the former Usina Santa Rosa de Viterbo.

Cargill, in partnership with the Usina Nova América, began to diversify its sugar-related activities after it started operating as a trading company exporting sugar to foreign markets and began to act in the Brazilian and worldwide markets as a supplier of industrial ingredients for the food industry. Cargill also supplies raw materials (organic and chemical fertilizers) for sugarcane production.

Corn Products International (Corn), following the separation of its food production unit to create BestFoods, has focused its attention on supplying ingredients to its associated company. Seeking partnerships with companies engaged in the primary processing of agricultural products, Corn entered into an association with Usina da Barra (Barra), which also acts in the sector of wheat grinding and flour production as well as in other primary agricultural processing sectors. The Corn and Barra alliance ensures the offer of invert sugar to the transnational company, which has exclusivity in its commercialization to the industrial market. Corn Products International diversified its actions in the Brazilian market by entering into an association with a national company of chemical specialties. The interest involved in these associations is the production of compounds.

As trading companies, as suppliers of raw materials to the agricultural sector or as buyers of sugar, these companies have financed the sugarcane crop, subordinating the sale of part of the sugar production to these financing contracts.
Another way that Tate&Lile operate is through Johnson&Johnson for the distribution of sucralose, a low calorie sugar developed and patented by Tate&Lile. Sucralose also uses cane or beet sugar as a raw material. Sucralose is a low calorie organic sweetener resistant to high temperatures and therefore suitable for industrial production. Sucralose, which serves as a raw material for light products, supplies market niches for products containing a lower saccharose content, but of organic origin, by substituting the synthetic sweeteners. Owing to their potential to cause cancer, the latter have been increasingly rejected for industrial consumption, due to the rejection of the end consumer or to the partial or total prohibition of sanitary authorities. Usina Albertina uses sucralose, supplied by the global Tate&Lile network, to produce Sucralight, reselling it as a raw material in the production of light products.

Another change observed in the transformation of the sugar chain is the transfer of molasses for the production of lysine (monosodium glutamate) through transporting ducts. The logistic chain of the transfer of molasses has undergone a paradigmatic change undertaken by Aji-No-Moto. This company of Japanese origin, as a shareholder of UNIVALEM, a sugar mill located in the northeast of São Paulo, receives its principal raw material – molasses – continuously through the duct, as well as vapors for its industrial plant located beside the mill.

Other initiatives to set up infrastructures for logistical changes, such as hydro, rail, road and shipping terminals, have been undertaken by COSAN, Cargill, Tate&Lile, Copersucar, Nova América and UNIVALEM. Unloading systems have been set up for the products supplied to industrial clients or for shipment of exports.

In the case of liquid and invert sugar supply, the receiving facilities are designed and overseen by the supplier mills. For supplies of molasses through the hydrouduct for the production of baking yeast, Aji-No-Moto, a shareholder of the UNIVALEM mill, installed a hydrouduct terminal for direct unloading into the tanks at the customer’s plant. These installations represent protective barriers against the action of other suppliers, given that their exclusive use is established by contract and technical specifications in the links connecting the different systems. These barriers ensure investments in fixed assets specifically for the setup of the infrastructure for the flow, loading and unloading of products. Linking the production lines of the user customer to the product delivery systems increases the power of the supplier who has the initiative for the undertaking.

This new linking element connecting the sugar chain to the food and beverage industry by means of the production of compounds or through the exclusive use of logistical infrastructures transforms the relations of sugar sales. The sugar mills now have an intermediary, functional and/or commercial, to place their products on the industrial market.

5. Conclusão

The findings of the field survey, therefore, indicate that restructuring of the sugar supply channel occurs due to the following factors:

- incorporation of technical progress in the process of transforming sugar into ingredients for the food industry, under the responsibility of the companies that hold the patents on biotechnologies, and

- holding of the points of transition/transshipment of the physical flow of products up to their delivery to their users.

At a tactical level, coordination of the sugar chain now requires capacitation for technical sales of liquid and invert sugar. The development of a learning process is necessary between the sugar supplier and the industrial buyer to render the new product, in liquid form, suitable for the industrial processes in which it serves as a raw material.

Another important factor that strengthens the coordination in the hands of global companies downstream from the mills is the submission of the mills to the established relationships that result in incorporations or alliances with the suppliers of industrial ingredients. These relationships favor the insertion of global corporations into the Brazilian market, insofar as these must face challenges in their local action in regard to the assimilation of cultural and linguistic differences. The alignment of managers of the local business units with those of the global company facilitates the assimilation of knowledge of the complementary activities that are the object of their diversification, both in the technical area and in the management of distribution
channels and marketing activities in the local market, given the knowledge that these local units already possess.

Changes in the variables and raw materials of productive processes and technical sales of raw materials with added services are, in most cases, interlinked, given the need to learn in order to adopt the changes incurred by the former. On the other hand, the two vectors interfere in the constitution of the third, since technical and organizational changes are normally needed to support the innovations adopted.

The motivation for this research work was the change in the institutional environment that the sugar and alcohol sector went through with the deregulation of the R&D, productive and commercial activities of the sugarcane agroindustry. This research has brought to light the process that the mills and/or distilleries have gone through to remain in the market. It was believed that these producer units would establish new forms of relating to other industrial segments and that these forms would require technological changes and organizational restructuring that would transform the traditional units into agribusinesses concerned with their corporate performance and active participants in the coordination of the sugar chain. However, the coordination of the sugar chain is headed by the producers of industrial ingredients in the segment of specialties. As set forth under item 2, this coordination has resulted in the creation of new relations, new activities and productive resources, with the companies operating downstream from the sugar mills controlling the users of these raw materials.

6. References


