CHANGES IN CONTRACTUAL RELATIONSHIPS IN THE SUGAR/ALCOHOL AGRICULTURAL CHAIN DUE DEREGULATION, ANALYZED FROM THE NEW INSTITUTIONAL ECONOMICS PERSPECTIVE

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ABSTRACT - The existing contractual relationships between sugar-cane producers and the sugar and alcohol industries are analyzed from the viewpoint of the *New Institutional Economics*. This paper identifies transaction characteristics, emerging contractual arrangements, and the effects of price liberalization over the production chain. The conclusions found are that contractual relationship fall within the theoretical framework and that changes brought by price liberalization have altered the organizational form of the system and imposed a new sugar-cane payment model.

Key words: New Institutional Economics, transaction characteristics, governance forms, institutional environment, deregulation.

INTRODUCTION

The Brazilian economy began to go through a deregulation process in the second half of the 1980s, which intensified in the 1990s. In the first four years of deregulation, great institutional alterations occurred in the coffee, wheat, and milk agricultural chains (agrichains).[2] The

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[2] Farina (1996. p. 61) mentions as examples the extinction of the Brazilian Institute of the Coffee, the privatization of the wheat commercialization, the deregulation of the milling industry, and the liberation of the prices of the milk received by the producer.

relationships among these system's agents were severely altered as rules and regulations in place for almost half a century were abolished. With deregulation, many of the government's functions became the responsibility of the several segments involved in the productive chains, making obvious the need for coordination among agents acting in the entire system. If the affected Brazilian industries were to achieve global competitiveness in the rapidly opening economy, then efficiency at each stage of the productive chain (acquisition of input, production, distribution and sale of the products) would became increasingly important.

In this context, the study of the deregulation of Brazilian agrichain systems and the new relationships invigorating members of the productive chains has became a very interesting source for analysis. According to Farina (1996, p.2), there was a need to identify "the tendencies of reorganization of the productive chains, the new competition rules that will develop, and the responsibilities which must be assumed by the different economic organizations—companies, the State, and associations of private interest—in the coordination of the agrichain business."

Until deregulation, sugar/alcohol sector activities had been conducted under a closely regulated production and marketing regime with the government dictating alcohol and sugar production schedules and the prices of sugar-cane, sugar, and fuels. Deregulation in May 1997 and May 1998 altered relationships along the whole productive chain, including those among sugar-cane growers, sugar/alcohol mills and distilleries, and fuel dealers.

The present work intends to analyze the price liberation of anhydrous alcohol, hydrous alcohol[3] and sugar-cane as it affects one *link* of the *Sugar and Alcohol Agrichain: the supply of sugar-cane to sugar/alcohol mills and to autonomous distilleries.*[4] In May 1997, the price of anhydrous alcohol was liberated, and in May 1998 the prices of hydrous alcohol

[3] The *hydrous alcohol* is used as fuel, the *anhydrous alcohol* is mixed to the gasoline in the proportion of 0,22 for 1 liter.

[4] The distinction between sugar/alcohol mills and autonomous distillery is that while the first can produce so much alcohol as sugar, the second produces only alcohol, what hinds it of choosing the alternative product according the best prices.

and sugar-cane were liberated. This paper will first examine the adopted transaction contractual forms to determine if they are aligned with the theoretical framework used, the *New Institutional Economics*, and to then analyze changes brought about by price liberalization.

SUGAR/ALCOHOL AGRYCHAIN CHARACTERIZATION

In 1996/97, according the Bolsa de Mercadorias e Futuros (1997), Brazil produced about 280 million tons of sugar-cane, 81.25% from its Center-South region and 18.75% from its North-Northeast region. Of the 225 million tons of sugar-cane produced in the Center-South, 43% were destined for use in the production of hydrous alcohol, 21% for the production of anhydrous alcohol, 21% for domestic sugar consumption, and 15% was exported as sugar. It is clear that the most important use of sugar-cane in Brazil is its conversion into alcohol, and the Sugar Alcohol Agrichain system is of great consequence to the cane grower.

The alcohol market

In November 1975, through Ordinance 76.595, Brazil's President Ernesto Geisel created Pro-alcohol, an incentive program to increase the production of alcohol in reaction to the petroleum crisis which threatened the country's economy. The creation of Pro-alcohol significantly altered the country's sugar and alcohol production profile, stimulating a significant increase in the hectares of sugar-cane under cultivation. According to Fernandes (1996), from '72/'74 to '92/'94, the amount of cane crushed in Brazil increased 215%; and in the Center-South region this increase was 296%. The evolution of Brazilian alcohol production is shown Table 1.

Table 1 - Evolution of the alcohol production by region (m^3)

Crop	Type of alcohol	North-Northeast	Center-South	Brazil
70/71	Hydrous	101,216	283,625	384,841
	Anydrous	16,413	235,984	252,397
	Total	117,629	519,609	637,238
80/81	Hydrous	369,121	1,233,227	1,602,348
	Anydrous	281,351	1,822,676	2,104,027
	Total	650,472	3,055,903	3,706,375
90/91	Hydrous	1,608,282	8,620,301	10,228,583
	Anydrous	199,019	1,087,549	1,286,568
	Total	1,807,301	9,707,850	11,515,151
95/96	Hydrous	1,323,121	8,260,971	9,584,092
	Anydrous	411,098	2,588,202	2,999,300
	Total	1,734,219	10,849,173	12,583,392
96/97	Hydrous	1,100,000	8,278,971	9,378,971
	Anydrous	800,000	3,851,658	4,651,658
	Total	1,900,000	12,130,629	14,030.629

Source: Carvalho (1997)

Notice the 2,101% increase in alcohol production from '70/'71 to '96/'97 shown in Table 1 (in the middle of the 1980s, sales of alcohol cars jumped to represent almost 95% of total auto sales). In '96/'97, production of hydrous alcohol decreased as the manufacture of alcohol powered cars was reduced; and production of anhydrous alcohol, a gasoline additive, increased. There are an estimated 15 million autos in Brazil, of which 3.8 million are powered by hydrous alcohol;[5] but current sales of alcohol fueled autos represent less than 1% of all auto sales. Alcohol car production in Brazil is now practically nil. It is estimated that there will be almost no alcohol powered cars on Brazilian roads after 2005.

In order to maintain the existing alcohol fueled auto fleet considering depreciation, 12% to 15% of total auto production must be alcohol fueled. That will only be possible through use of incentives and a more enticing marketing program to insure sufficient dependable consumer

[5] See: *"Programa de incentivo em franca decadência."* Gazeta Mercantil Latino Americana, 4a. 10th of May 1998, p.14

demand. If production is not maintained or the percentage of anhydrous alcohol now mixed with gasoline is not kept at 22%, the demand for the alcohol will drop. A reduction in alcohol demand will cause a reduction in the conversion of sugar-cane to alcohol rather than sugar, and will lead to an excess supply of sugar, forcing a decrease in sugar prices.

Brazil is the world's largest producer of ethanol. In 1996 it was responsible for approximately 50% of global ethanol production: According to Carvalho (1997), in 1996, Brazil produced 14 billion of the 25.9 billion liters of ethanol produced globally; the United States produced 6 billion liters; other countries of the Americas produced 2.2 billion liters; Asia produced 1.8 billion liters; Europe 1.4 billion liters; Africa produced 0.4 billion liters; and Oceania produced 0.1 billion liters.

The sugar market

In the 1996/1997 crop year, Brazil was the world's second largest sugar producer (11% of world production) after India (12%). The other main world sugar producers were Thailand (7%), China (6%), Australia and the United States (5% each), France, Germany and Mexico (4% each), Cuba (3%), Indonesia, South Africa and Ukraine (2% each); the remaining world production is divided between several countries (Bolsa de Mercadoria e Futuros, 1997).

In the 1995/1996 crop year,[6] Brazil was the world's largest sugar exporter having increased sugar exports 142% from the '86/'87 crop year. Table 2 shows the main sugar exporting countries for the crop years '86/'87 and '95/'96.

[6] The international 95/96 crop is comprised among the months from out/95 to set/96.

Table 2 - Percentage of the world's exports of sugar

Countries	'86/'87	'95/'96
Brazil	8.0%	19.4%
Thailand	8.0%	16.6%
Australia	11.5%	15.7%
Cuba	29.0%	13.6%
USA	12.5%	8.9%
Others	31.0%	25.8%

Source: Carvalho (1997)

The fact that Brazil, Thailand, and Australia increased their proportion of total world sugar exports from'86/'87 to '95/'96 (while Cuba and United States reduced theirs) can be interpreted as a real increase in amount exported. During that period, world consumption also rose, although at a smaller rate than the rate of production increase (Carvalho, 1997).

Brazil's sugar production is concentrated in the Center-South region. Carvalho (1997) examined total Brazilian sugar production from the '90/'91 sugar crop and found that of the approximately 147,306,890 50 Kg bags produced, 38.87% came from the Brazilian North-Northeast and 61.21% was from the Center-South. Brazil's '96/'97 sugar production was 275,567,700 50 Kg bags, an increase of 87% from '90/'91 level. The Center-South region accounted 76% of this production.

The volume of Center-South region sugar exports has been rapidly growing in relation to exports from the North-Northeast, the country's traditional export region. The North-Northeast was responsible for 93% (1,145,826 t.) of total sugar exported from the '90/'91 crop and 32% (1,613,179 t.) of the '95/'96 crop. The Center-South region was responsible, therefore, for 68% of the sugar exported from Brazil's '95/'96 crop (Carvalho, 1997). This export increase is greater that the region's production increase and probably resulted in a sugar surplus as consumption in the region increased less than production. According to Carvalho (1997), there was a 23.80% apparent consumption increase and a 70.90% production increase in the South-Center region between

'92/'93 and '96/'97. Consumption data for the North-Northeast region is only available for the '96/'97 crop. Sugar production growth has outstripped consumption growth and led to a sugar surplus on the order of 113,023,813 50 kg bags of from the '96/ '97 crop (Carvalho (1997). This surplus sugar has made Brazil the world's largest sugar exporter.

METHODOLOGY

In this work, the different forms of contractual arrangement between sugar-cane suppliers and sugar/alcohol mills and distilleries are analyzed from the *New Institutional Economics (NEI)* perspective. The analysis utilizes the theory of *Transaction Costs Economics* developed by Oliver Williamson in 1985 and complemented in 1990 by Douglas North's theory regarding the *institutions* hole in economic development.

When a firm needs inputs to produce its products it can opt for different transaction forms: to buy them directly in the market, to produce them itself, or to select one of many mixed forms of supply (partnerships, leases, etc.). The producer has the same options for product sales: deliver its products to a distributor who controls the product until it is sold to the final consumer; take charge of the transport, distribution, and sales itself; or the producer can opt for mixed, intermediate transaction forms.

According to *Transaction Costs Economics*, the most efficient way to deal with input and product goes beyond managerial strategies involved with production costs and should take into consideration other costs: the *transaction costs*—the costs of making the economic system work. These costs appear when the system of prices is used to determine resource allotment in a biased environment. Arrow (1969) makes an analogy between *transaction costs* and *frictional force* in mechanical systems: they both imply losses in efficiency and should be taken into account; unfortunately, though losses not considered in the models of classic physics (hypothesis ignoring friction) can be easily measured in the laboratory, those losses hypothesized using the system of prices as the alloter of resources in a non neutral environment are not so easily quantified.

The choice among the several manners of governing a transaction,

the *governance forms*, is made between *doing itself* (to produce the good under a hierarchical self-administered structure), *to buy* (to use the market), or *to adopt hybrid forms*. The decision is based on the most efficient transaction form, one which *minimizes* both the *production costs* and the *transaction costs*. High transaction costs make inefficient use of the market and favor the hybrid or hierarchical forms.

In *Transaction Costs Economics,* a contractual vision of the firm is adopted. According to Williamson (1985), this vision is understood, as a *nexus of contracts* disciplining the transactions. He perceives the *transaction* as the analytic unit which accounts for "the transformations of a product through technologically separable interfaces." Williamson posits that the transactions present *measurable attributes*[7] related to the *specificity of the involved assets*, to *uncertainty*, to the *frequency of the transactions*, to *duration*, and to *complexity.* These measurable attributes, when considered with reference to the theory's *behavioral presuppositions,* define the more efficient organizational *governance forms: the market, the hybrid or hierarchical forms.*

Williamson (1985) also introduces basic presuppositions about the behavior of the agents. His concept of *limited rationality* (the impossibility of constructing complete contracts, due to the agents' limited capacity to predict system actions and results) and *opportunistic* agent *behavior* (the participants, at some moment, will adopt opportunistic behavior) seem to align his theories with reality, where uncertainties and asymmetric information coexist. The realities of human capacity and behavior should be considered in when making contracts, which implies costs associated with the incorporation of safeguards into the contract, such as inspection routines to verify contractual adherence and control mechanisms to correct deficiencies.

Transaction costs[8] are the "ex-ante" costs to prepare, negotiate, and safeguard an agreement and the "ex-post" costs to make adjustments

[7] When noticing that the transactions present *measurable attributes*, Williamson allows that each transaction can be measured in accordance its respective attribute, allowing one to order the different *transaction costs* involved in each case and justify the emergence of different organizational forms.

[8] The *transaction costs* increase the more specific the assets, the more complex and uncertain the transactions, and as less frequent and less similar they are.

and revisions when a contract is affected by flaws, mistakes, omissions, and unexpected alterations. Such costs are wider than the neoclassicist's production costs, and they view the firm not as a mere production function and but as a "nexus of contracts." Transaction costs therefore correspond to the cost of making the economic system work in an uncertain environment and are affected by *transaction attributes* and *behavioral presuppositions.*

Therefore, the gains arising due to the choice of more efficient governance structures can be considered as important as those derived from technological choices. Unconventional contracts (vertical integration, franchising, etc.) also can be seen as methods of increasing efficiency (reducing transaction costs, in the presence of specific important assets), not just as methods used to increase monopoly power and weaken the restrictions found in *antitrust* legislation. Transaction Costs Economics allows analysis of the forms as the economic agents organize their transactions—from strategic alliances among the great groups, through to the relationships involving small and medium participants in the productive chain—considering factors related to the assets involved in the transaction.

On the other hand, Masten (1994) brings up barriers to the practical application of *Transaction Costs Economics* involving data sources and measurement. Specific data regarding prices, quantities, and costs are normally used to test economic hypotheses; but according to MASTEN the data needed to test *Transaction Costs Economics* hypotheses involve "...organizational forms as well as such detailed information about the character of the transactions as the level of uncertainty associated with exchange, the complexity of products and processes, and the extent to which assets needed for production are specific for the particular relation" (6). The data used in the application of *Transaction Costs Economics* theory are often obtained from interviews and questionnaires that request the cooperation of agents involved in the process; these data are often hard to obtain and subjective.[9]

[9] Masten (1994) presents other considerations about the necessary data and the measurements issues of the transaction costs, besides some papers that use some proxies to compare the transaction costs in different situations.

The *New Institutional Economics* recognizes that the operation and efficiency of an economic system are influenced by the *institutions* that regulate economic, social, and political relationships. Douglas North points out the importance of *institutions*, which he defines as "human devised constraints that structure political, economic, and social interaction. [These constraints] consist of both informal restrictions (sanctions, taboos, habits, traditions, and codes of conduct) and formal rules (constitutions, laws, property rights)" (97). According to North, there is a relationship between different *institutions* and *economic development*: some institutions promote development, others hinder it. Alterations in the institutional environment (new legislation) alter the system's operation and efficiency creating a need to alter the established contracts.

Zylbersztajn (1995) asserts that a study of agribusiness systems from the perspective of the *Transaction Costs Economics* theory must not only consider the *transaction,* the typical unit of analysis, but also the *institutional environment* in which the transaction take place. In this way, *Transaction Costs Economics* theory would predict that the more efficient governance structure is that one that reduces transaction costs while taking into consideration the institutional environment's affect on these costs. Zylbersztajn points out that analysis of the variables related to the transactions' characteristics will define the forms of efficient governance, and analysis of those variables related to the institutional environment indicates a vector of parameters influencing the governance structure reducer of the transaction costs. He proposes some important variables that should be considered when analyzing typical agribusiness system transaction costs; listed in Figure 1.

Figure 1 - Important Variables in the Analysis of the Transaction Costs

Characteristics of the Transaction • Asset specificity (k) • Frequency (f) • Uncertainty (u)
Contractual aspects • "Ex-post" flexibility • Contractual drawing • Incentives • Public and private arbitration • Trust

Institutions and organizations
• Institutional environment
  • Legal system
  • Cultural aspects
  • Tradition and habits
  • Political organizations
  • International aspects
• Organizational environment
  • Public and private bureaus
  • Associations
  • Political Organizations
  • Information
  • Technology

Source: Zylbersztajn (1995)

In summary, when analyzing relationships between sugar-cane suppliers and sugar/alcohol mills and distilleries, it is important to identify and determine the significance of some of the variables listed in Figure 1: *the characteristics of the transaction*, the *contractual aspects,* and the *institutions and organizations* involved. One needs to determine

the *characteristics of the existing transaction:* the *degree of specificity* and *uncertainty* and the *frequency* and *duration of the assets involved.* One needs to examine the *contractual aspects*: contractual safeguards, access for inspection, and incentive and control mechanisms, while remaining cognizant of Williamson's *behavioral presuppositions* (limited rationality and opportunistic behavior on the part of the agents). Finally, one must analyze the existing *institutions* and *organizations* which impact the sugar-cane growers and processors.

TRANSACTIONCHARACTERISTICS, CONTRACTUAL ASPECTS, INSTITUTIONS AND ORGANIZATIONS OF THE SUGAR/ALCOHOL SYSTEM

Transaction characteristics

The assets specificity

According to Williamson (1991, 105), asset specificity refers "to the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value:" how specific an asses is for a transaction and what is the cost involved in its reallocation. He distinguishes six types of asset specificity: *site, physical, human, brand name capital, dedicated assets*[10] and *temporal specificity*. *Non specific* assets are easily put to alternative uses; therefore, dependence between the transaction agents is non-existent and market use becomes efficient. As the level of assets specificity increases, dependence among the parts increases. This imposes additional risks and increasing costs associated with renegotiation, which biases the market toward hierarchical relationships; and biases lead to inefficiency.

For the sugar alcohol system, *site specificity* is an important cost consideration. A poorly located production facility may lead to higher

[10] They are those investments accomplished for a specific customer, without alternative use.

freight costs (R$/t). Though, it was found that the cost of transportation per kilometer is practically constant for shipping distances of between 60 km and 90 km, around R$ 0.07/t./km, according to data from SIFRECA, of ESALQ/USP.

Another important specificity is *temporal*. Temporal effects include sugar-cane *deterioration* and *cane supply concentration at certain periods*. As cane prices are adjusted according to saccharose content, growers attempt to harvest and deliver the cane when saccharose levels are high. This leads to seasonal supply excesses and deficiencies and may indicate that the existing incentives (prices) are perhaps not having the proper effect.

Physical specificity refers to the equipment used by cane growers, sugar/alcohol mills and distilleries—harvesters, cane milling machinery, alcohol storage tanks, etc.—and how exclusively the apparatus is adapted to the production of sugar or alcohol (sugar/alcohol mills) or only for alcohol (autonomous distilleries). The growers often have a large, leveraged investment in the equipment specific to cane cultivation and the materials to plant, cultivate, and treat the field. The growers remuneration comes one year after planting when the first crop is harvested and sold to sugar/alcohol mills or distilleries. Sugar/alcohol mills and distilleries depend on the sugar-cane. Thus, the existence of *bilateral dependence* between the parts, growers and processors, is characteristic.

Although *technology* employed in the sugar system does not seem particularly particular, being both diverse and available, it presents a certain degree of specificity due to its sophistication. The processes should constantly evolve in order to minimize expenses, maximize productivity, and secure a competitive advantage.

The transaction uncertainty

Uncertainty comes from *unexpected* transaction difficulties that develop due to *nature*, each *agent's strategy,* and political or economic conditions. In the sugar/alcohol system, uncertainty problems arise from *climatic conditions* and the appearance of cane *plagues*, problems inherent in agricultural activity. Inappropriate climatic conditions, *frost, drought, flood,* can cause lasting damage, to both to current and future

crops (*inadequate pluviosity* alters sugar-cane and affects saccharose content). Both processor and grower uncertainty increases if there is a lack of *transparent* sector *policies*. Unforeseen changes in the *institutional environment* can alter pre-existing relationships and raise the negotiation's "ex-post" costs.

The frequency and duration of the transactions

The *frequency* and *duration* of the transactions refers to contractual *repetition* and *durability*. The contracts usually last at least five years (the median life of a cane field). Cane harvest comes one year after planting; and that cane can be cut, on the average, five more times. Cultivation of sugar-cane requires a large investment (machinery, chemical treatments, fertilizers, culture treatments, etc.), and the sugar/alcohol mills are dependent on the cane to maintain production (no raw material substitute exists). Therefore, *bilateral dependence* develops; both *the cane growers* and *the sugar/alcohol mills* profit from *frequent* and *durable* relationships. This desire for stability leads to long term contracts and the possibly of vertical integration or plantation acquisition.

Given the *level of assets specificity* (medium to high), the *uncertainties*, and the *frequency* and *duration* of the transactions, mixed or hierarchical relationships are the more efficient organizational forms. This is evidenced in the tendency toward formal contracts between mill and suppliers, which often leads to vertical integration. According to data from the Organization of Cane Suppliers of the State of São Paulo (ORPLANA), most of the sugar-cane (72.53%)[11] from the '94/'95 crops destined to mills and distilleries in the state of São Paulo came from businesses organized hierarchically, as suggested by the theory of *Transaction Costs Economics*.

[11] See *Technical Evaluation of the System of Payment of Cane for Sacarose Content, Crop 94/95*, ORPLANA, Piracicaba.

Contractual aspects: "ex-post" flexibility, drawing up contracts, and incentives

"Ex-post" flexibility and drawing up contracts

The presupposition of *limited rationality* assumed by Williamson (1985) implies the impossibility of building complete contracts, not irrational behavior. According to Farina (1996, apud Simon), the *intention* of being rational doesn't imply rationality, since the future environment is unpredictable. Therefore, contracts should contain safeguards that both secure and flexible enough to adjust for unexpected events.

Limited rationality, analyzed in the context of the sugar alcohol agrichain, refers to the agents' difficulties (growers and processors) in foreseeing the government's future sugar and alcohol related policies. Since stock levels of cane and alcohol are essentially determined by government guidelines, government policies can significantly impact planning at the plantation and production levels

When the Federal Government announced liberation of the sugar/alcohol sector, its '97/'98 Crop Plan was in place. With the announcement of sector liberation, agents expected a *zero aliquot* (zero tax rate) [12] on all exported sugar, but the Crop Plan's export tariff was essentially kept in effect (Burnquist, 1977) and national production volumes of sugar and alcohol were still fixed. Government sector policies both obscure and stalled. The politically controversial *Pro-alcohol* program has become obscure in its policies. The government also created the *Interministerial Council of the Alcohol* in 1997 to conclude work on a constitutional amendment stimulating the use of hydrous alcohol as an alternative fuel. They were to be impetus behind a "green tax," but few concrete actions have been taken.

[12] Actually what is contained in Central Bank's *Circular 2767*, is that the increase in the quota of tax exempt exports (from 5,4 million to 7 million tons), and not the elimination of total tariffs ("Incentive to Sugar Export." *Gazeta Mercantil*. 14/07/97).

Incentives

The hypothesis of opportunist behavior advances the theory that the agents will behave opportunistically at some point. In order reduce the dangers inherent in opportunistic behavior, *inspection and control mechanisms* or *incentives mechanisms* need to be incorporated in any contract, although both imply additional transaction costs.

Opportunistic behavior can affect the *pre-contractual* phase of negotiations. One of the negotiating party's may conceal some information that, if known by the other party, would severely impact the contractual relationship. This type of behavior is known in the literature as *adverse selection*. When opportunistic behavior occurs *post-contractually*, due to asymmetry of information, it is called a *moral hazard*.

In the sugar/alcohol sector, an example of *adverse selection* affecting the sugar alcohol mills would be delivery of cane at below requested quality. This problem can be solved using an incentive mechanism that provides a bonus for sugar-cane with a higher saccharose content (additional payment for cane of better quality).

The theories of *limited rationality* and *opportunism* are aligned in that both reveal the need for *contractual safeguards. Limited rationality* emphasizes the difficulty of drawing *complete contracts* that guarantee the continuity of the contract. This also leads to the need for *inspection and control mechanisms* to assure that the intent of the contracts will be realized as unforeseen situations arise. Guarantees against the harm caused by the agents limited rationality and opportunistic behavior have costs; contractual safeguards have "*ex-ante*" transaction costs, and inspection and control mechanisms have "*ex-post*" costs.

There are basically three types of business arrangements govering the supply of sugar-cane to the mills and distillers: *own sugar cane* (a sugar/alcohol mill is the owner of the cane field), *cane supplier* (a sugar-cane supplier/grower furnishes the cane to the sugar/alcohol mill), and the *partnership or lease* system (a sugar/alcohol mill leases a field from a grower).

Usually, in the "own-cane" system, the sugar/alcohol mill/distillery is the owner of the field and takes charge of the whole farm productive process (planting, treatment, harvest, and transport). The "cane-supplier" system is one in which the cane supplier takes charge of the

whole process, delivering the cane to the sugar alcohol mills/distilleries and receiving a *premium* or *discount* as a function of the cane's saccharose content, evidencing an incentive mechanism to insure product quality. In the "partnership or lease" system, different relationships among the partners exist, their main characteristic is that the responsibility is spread between partners or between the lessee and lessor for executing the various steps in the cane production process, as it is shown in Figure 2.

Until the '96/'97 crop, payment to the sugar-cane grower/supplier or partner in the partnership systems was based on the government dictated price/ton of sugar-cane. In the partnership system, each contract pre-established that a specific number of tons of cane per square yard go to a partner as payment for his input. The number of tons/square yard varied, not only as a function of each partner's responsibilities but also due to technical factors that influence the costs incurred: quality of the earth, topography of the land, distance from the cane field to the sugar/alcohol mill. (represented in Figure 2)

Figure 2 - Partnerships systems between Sugar/alcohol mills and Farm proprietors.

partnerships systems	Type of Service	Responsible for the Execution	
		Mills/Distilleries	Owner of the Earth
Type 1	Plant	*	
	Treat	*	
	Crop	*	
	Transport	*	
Type 2	Plant		*
	Treat	*	
	Crop	*	
	Transport	*	
Type 3	Plant		*
	Treat		*
	Crop	*	
	Transport	*	
Type 4	Plant		*
	Treat		*
	Crop		*
	Transport	*	
Type 5	Plant		*
	Treat		*
	Crop		*
	Transport		*

With the newly liberated prices of sugar, hydrous alcohol, and anhydrous alcohol, there was a need to establish a new cane remuneration scheme for the '98/'99 crop. A scheme that addressed the interests of both the processors and growers, and facilitated product marketing in this new, deregulated atmosphere. This will be discussed in Section 5.

Institutions and organizations: the institutional environment

Until the crop of '96/'97, the sugar/alcohol sector was rigorously regulated with stringent production and marketing controls. Annually, the government published the *Crop Plan* setting sugar and alcohol quotas for each of the great producing areas (North-Northeast and Center-South) and individual quotas for each industrial unit. The government dictated prices for sugar-cane, refined sugar, and alcohol. The *National Department of Fuels* together with dealers (BR, SHELL, TEXACO, etc.) and producers established monthly sale's quotas for commercial alcohol fuels.

On December 13, 1996, the Brazilian *Ministry of Finance* emitted Decree no.294, initiating the liberation of sugar/alcohol sector prices and production quotas. The decree ordered the deregulation of anydrous alcohol prices starting May 1, 1997, and defined a sugar-cane and hydrous alcohol price liberation schedule to be put in place May 1, 1998. In **Preços Agrícolas**, Burnquist (1997) notes on the *Proposal of the Decree*: The Proposal was published jointly by the *Director of the National Department of Fuels* and the *Director of the Department of the Alcohol and of the Sugar*, to make public the new set of rules for total sector deregulation (23).

The institutional environment was earlier altered when the *Council of the Sugar alcohol Sector of São Paulo* was created on December 1995 as part of the *State of São Paulo Program of Development and Competitiveness*. The Council seeks to influence sector efficiency and competitiveness by focusing attention on sector related economic, environmental, and social subjects.

INSTITUTIONAL CHANGES AND ALTERATIONS IN CONTRACTUAL FORMS

Deregulation of the sugar/alcohol sector brought significant structural changes affecting relationships along its agrichain. According to North's theory (1991), the entire sector must be forced to adapt and coordinate its actions to meet the challenges presented by the new, government mandated sector policies (actually a reduction in policies).

In the State of São Paulo, agents mobilized to alter the sector's organizational environment. This lead to the creation of the *Union of Sugaralcohol Agrichain of São Paulo (UNICA)* in April 1997 to replace the *Association of the Industries of Sugar and Alcohol of the State of São Paulo (AIAA). UNICA,* in an effort to coordinate the resources of the sugar/alcohol, united the common interests of six entities within the sector: (i) *the Cooperative of the Producer of Sugar and Alcohol of the State of São Paulo (Copersucar), (ii) the Association of the Sugar/alcohol Industry of the State of São Paulo (Sucresp), (iii) the Society of the Producer of Sugar and Alcohol of the State of São Paulo (Sopral), (iv) the Association of the Autonomous Distilleries, (v) the Union of the Industry of the Sugar of the State of São Paulo (SIAESP), and (vi) the Union of the Industry of Production of Alcohol of the State of São Paulo (SIFAESP)* (Burnquist, 1997).

With the May 1997 liberation of anhydrous alcohol prices and the May 1998 liberation of hydrous alcohol and sugar-cane prices, a new cane pricing policy was needed by both the cane supplier and the sugar/alcohol mills and distilleries. The change in pricing policy necessitated contractual "ex-post" alterations, since the contracts regulating farm land leases specified that payments be a function of the sugar-cane prices previously mandated by the government's *Clerkship of Regional Development.*

The Brazilian legal system's inefficiencies—judgment is rendered very slowly, and trials are expensive—combined with sugar-cane's perishable nature discourages use of the courts for "ex-post" conflict resolution. Normally, the cane grower does not prosecute the sugar/alcohol mill owners for contractual misconduct. The grower usually has too few economic resources to conduct an action against the mill's legal staff, and the grower's product is perishable, deteriorating while the dispute drags on. Delay in judgment is also harmful to the sugar/alcohol mills,

since they need the raw material for continued operation. Under these conditions, both try to reduce the high costs of "ex-post" negotiations by finding a collective solution.

After sugar/alcohol sector liberalization, the *Organization of the Planters of Cane of the State of São Paulo (ORPLANA),* a growers group, and the *Union of the Sugar/alcohol Agrichain of São Paulo (UNICA)* an industry group, each sent five representatives to develop a new model for sugar-cane remuneration. Their new remuneration model was presented on April 14, 1998, at the headquarters of *Bolsa de Mercadorias e Futuros* (BM&F, Commodities and Futures Stockmarket) in São Paulo to take limited effect on May 1, 1998.[13] In the new pricing policy, the *purity of the broth* and cane *Pol%* continue to serve as the basis for cane payment, but instead of being used to calculate the *Saccharose content* of the sugar-cane, they will be used to calculate the amount of *Recoverable Total Sugar (ATR)* (SILVA, 1998). The cane's value is now determined by the amount of *ATR* and by the internal and external market price for sugar and alcohol. Using this new model, prices oscillations in the alcohol and sugar markets are reflected in the price of Brazilian sugar-cane: the cane grower is no longer insulated from the final product markets .

The elaboration, implementation, and future modification of this new model demand a sizable effort by the whole sector. Although analysis of the variables listed in Figure 1 indicates that transaction cost reduction is best achieved through governance leading to a hierarchical or mixed form of supply management (cane supply is derived through leases, partnerships, or sugar/alcohol mills and distilleries ownership of cane plantations), alterations in the institutional environment, as pointed out by Zylbersztajn (1995), influence the transaction cost reduction governance structures. At this time, given price liberation, it may be that a new form of sugar-cane supply relationship will be more transaction cost efficient.

[13] See the article "Changes the system of negotiating sugar-cane", of the Gazeta Mercantil, p.1, 14/4/98.

To face price liberation and external competition, the sugar/alcohol sector is attempting to reduce costs, not so much industrial processing costs as the costs of input acquisition. Price liberalization and competition should lead to an increase in sugar-cane productivity while, at the same time, total acreage unsuitable for mechanized farming is expected to decrease. To maintain and improve economic efficiency, cane processors must compare the costs associated with plantation ownership, partnership contract administration, and dependence on private growers/suppliers for cane supply, while respecting the aspects of bilateral specificity involved in the transaction. It is expected that partnership contracts will prevail where the landowner's land is amenable to low production and transport costs: fertile, level land, located adjacent to the mills. Partnerships contracts with landowners whose acreage requires elevated production expenditures should be allowed to lapse, as competitiveness reigns in this newly deregulated environment. Over the near run, the price of cane, now linked with final product prices under the new pricing program, should fall due to the large existing supply of alcohol and sugar. This leaves some time for the processors to adjust to the new conditions and improve efficiency. [14]

CONCLUSIONS

Considering the *attributes* associated with *transactions* in the sugar/alcohol agrichain and the hypotheses of *limited rationality* and *opportunism*, it should be expected that hierarchical or hybrid supplier/processor relationships are the current efficient contractual forms. This was found to be true for the state of São Paulo's '94/'95 sugar-cane crop.

Due to changes in the institutional environment and the liberation of anhydrous alcohol, hydrous alcohol, and sugar-cane prices, there were changes in the established relationships between segments in the sugar/alcohol chain. A new model for sugar-cane remuneration was

[14] See the article: "Production in rise knocks down the prices" Gazeta Mercantil,, p.C-7, 14/4/98.

created that altered the contractual format. Given the attributes of the transactions involved, it is expected that hierarchical organization will continue to be the more efficient form for the supply of sugar-cane to the sugar alcohol mills. The organizational change imposed by deregulation also acted to improve sector coordination as a whole.

The search for competitive advantage in the newly deregulated sector has now become even more important. Efficiency has become paramount, and it is expected that processors will search for partnerships with growers whose lands are suited to minimal cost cane production and shipping. Without government price and supply regulation, only the most efficient will survive.

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