

ORGANIZATIONAL SUSTAINABILITY: A CASE STUDY OF A COMPANY IN THE BRAZILIAN SUGAR-ETHANOL COMPLEX

Eduardo Guilherme Satolo, edgsatolo@unimep.br

Universidade Metodista de Piracicaba (UNIMEP), Rodovia Luis Ometto, Km 1, Santa Bárbara d'Oeste, São Paulo, Brazil, +55 19 3124-1767

Felipe Araújo Calarge, fcalarge@uninove.br

Universidade Nove de Julho (UNINOVE), Av. Francisco Matarazzo, 612 – Prédio C - 1º Andar – Água Branca – São Paulo, +55 11 3665-9325

Abstract. *The Brazilian sugar-ethanol agribusiness, emerges as one of the promising sectors in the field of alternative energy, and is considered a major substitute for fuels obtained from the petrochemical industry. However, aspects related to the biofuels production process have recently suffered criticism, mainly related to environmental and social impacts, compromising aspects related to the sustainability. Within this context, this paper aims to analyze the level of organizational sustainability of a Brazilian company in the sugar-ethanol industry, which is considered one of the world leaders in biofuels technology. In that sense, it was conducted a case study in a plant of the largest sugar-ethanol company in Brazil, which also stands out in the world as the largest producer and processor of sugar cane; the largest producer / exporter of ethanol . The degree of organizational sustainability was evaluated through the application of questionnaires, considering the responses a weighting based on Likert scale. The results show that the company already has a corporate structure responsible for addressing issues relating to sustainability, especially the social responsibility, environment and occupational safety and health, being disseminated in the organization's culture of waste reduction, control of natural resources and a policy for receiving and recording of complaints, suggestions or demands of the people affected by its operations, products or services. However, the research also indicated aspects to be improved with the corporative sustainability goal. The strategic planning and the concern of top management are key points that need better structuring, through the promotion of strategies for growth and development of products that take into account the problems related to global warming. Similarly, the knowledge diffusion and sustainable growth culture should start from the top level organization commitment. The conducted research has draw a view of the sustainability of an Brazilian sugar-ethanol company, which is highlighted by its role on the world biofuels production. The results highlighted that is still at an early stage as to the sustainable management, being evidenced by the low commitment of top level management and uncertainty about the goals and actions to be performed in order to establish the culture for the sustainability in the organization.*

Keywords: sustainability; Brazilian sugar-ethanol agribusiness; organizational sustainability

1. INTRODUCTION

The sugar-alcohol agribusiness complex, responsible for the production of sugar and alcohol (anhydrous and hydrated), has appeared as one of the most promising sectors in the alternative energy field, both in the domestic and in the export markets.

Brazil, up to 2006, was the world leader in alcohol production, having a broad advantage on the other producing countries. However, in 2007, the United States of America took on Brazil's position. Thus, there has been a lot of debate about finding new technologies for taking this leadership over. Cruz (2007) cites that the country needs to have new technological discoveries, but they need support by scientific methods, in such a way that this leadership is retaken in a sustainable way. According to the author, the current Brazilian position is due to the development of technologies by trial and error, and that the non-accomplishment of scientific approach researches will result in the loss of its global market position in five years.

Along with this discussion about the development of new scientific knowledge, there has also been a lot of debate about the sustainability aspects related to the sugar-alcohol complex in order to avoid what happened in the late nineties, with the *Proálcool* Program (MORENO e CARLO, 2007).

The *Proálcool* (National Alcohol Program) was a large-scale substitution program for automobiles from petroleum derivatives to alcohol, funded by the government due to the oil crisis from 1973, which had its peak by the end of the nineties, but lost its attractiveness with the drops in oil prices in the international market. As an aggravation, the sugar price started to increase in the global markets while the alcohol prices dropped, making it more advantageous to produce the former than the latter. This inversion in production created successive supply crises, leading the *Proálcool* program to disbelief by consumers and automakers, and, since then, the production of fuel alcohol and alcohol-propelled vehicles started going down, reaching a point when the automakers did not even have the option of alcohol in their newest models (MARQUES *et al.*, 2006).

With the discussion about sustainability and aspects related to the environment protection, the matter of using biofuels reappeared, putting the sugar-alcohol sector facing new technological and competitiveness challenges.

Within this context, this article seeks to analyze the organizational sustainability degrees of companies in the sugar-alcohol sector located in the Piracicaba City micro region, in Sao Paulo State. For doing this, the work is divided into four sections. The first one highlights the main topics involved in the concept of organizational sustainability. The second one reports the methodological aspects for conducting case studies with the companies in the sugar-alcohol complex. The third section describes the results from the data gathering and a critical analysis about them. Finally, the last one presents this work's conclusions and the perspective for future ones.

2. THE PROCESS OF SUGAR AND ALCOHOL FABRICATION

In Brazil, alcohol is produced from sugar cane. In other countries, like the United States of America, corn is the raw material for it. It is also possible to produce sugar from sugar cane, and its production is commonly linked to the alcohol production.

Sugar cane is a raw material with multiple purposes. The intermediate products have a specific versatility, being subject to different industrial processes resulting in several derivatives and byproducts (SZMRECSÁNYI, 1979). As we can observe in Figure 1, the transformation of sugar cane into sugar and/or alcohol starts with the extraction of its juice through grinding.

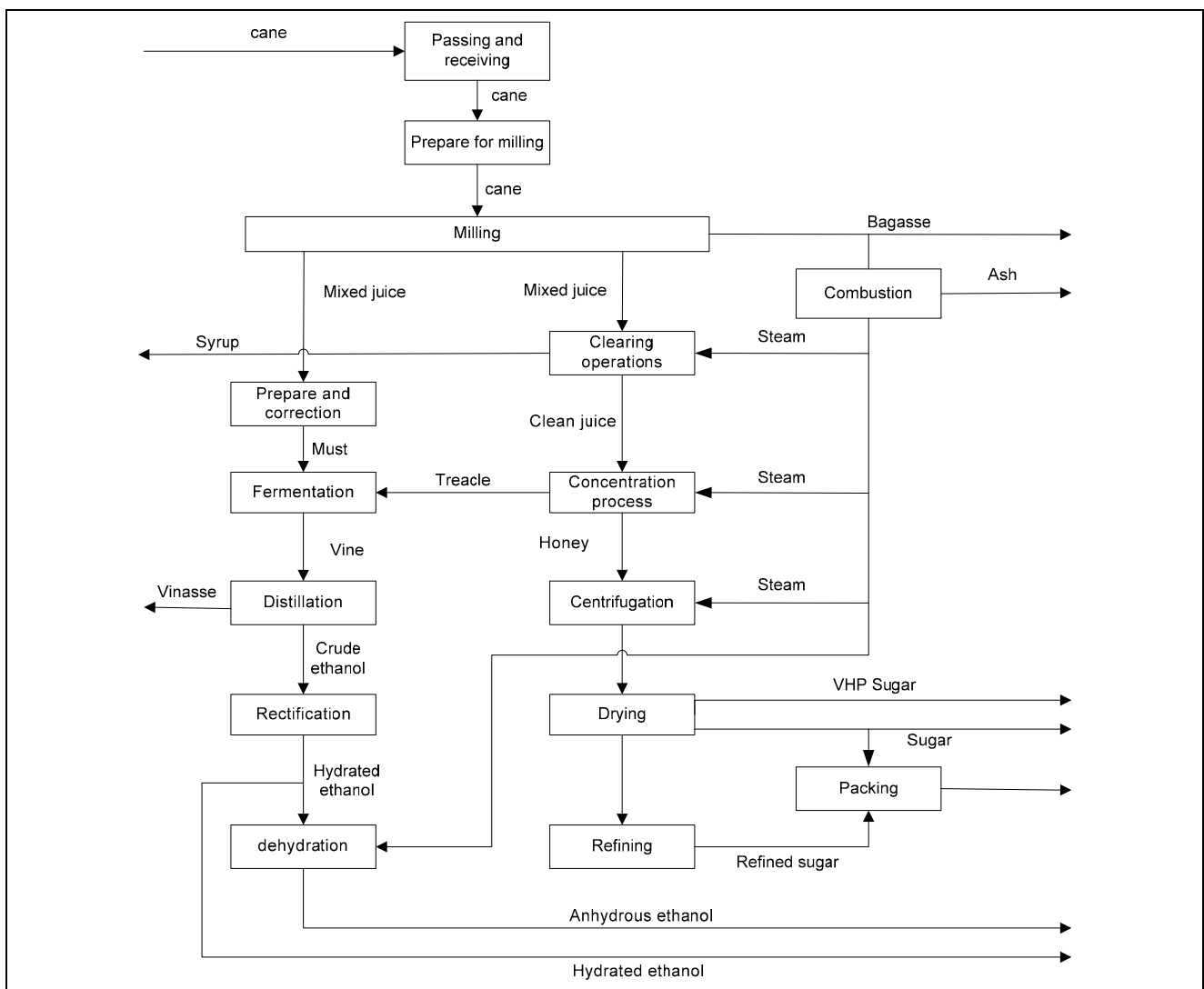


Figure 1 - Simplified scheme on the alcohol and sugar production (SATOLO, L. F., 2008)

If the mixed juice is bound to alcohol production, after the operations of preparation and correction, the fermentation, the distillation (which has the vinasse as a byproduct) and the rectification are performed. The result coming from this process is the hydrated alcohol that – after being dehydrated – may be transformed into

anhydrous or – after adding one or more flavoring or sour-smelling substances (in order to prevent its usage in beverages, food or pharmaceutical products) – may be transformed into unnatural hydrated alcohol (SATOLO, L. F., 2008).

For fabricating sugar, the juice passes through clearing operations (with sulfide gas and lime milk) for flaking impurities, destroying dyes and neutralizing the pH. In evaporators, the excess of water in the clean juice (or cleared) is taken out, resulting in a thick liquid called syrup. The concentration process goes on until crystallization happens through super saturation. The formed crystals, enveloped by a sugary solution called honey, which recirculates in the concentration process until it reaches exhaustion – when it is withdrawn with the name of residual honey, being usually sent to alcohol production. In the dryer, the sugar is dried and cooled, being sifted afterwards for eliminating lumps before being packed (ARAÚJO, 2002).

The bagasse can be used in several ways: in the field, it works as a dead cover and organic fertilizer or bedding for animals, though its most common use in mills is as fuel for generating steam and energy. The leftovers of its combustion (ashes and debris), the filter pie and the vinasse are also used as fertilizers. The molasses, by its turn, if not used in the alcohol production, may also be used as input in the production of cattle food (SATOLO, L. F., 2008).

3. THE ORGANIZATIONAL SUSTAINABILITY

Nowadays, it is possible to find companies that treat the subject “sustainability” as something common and usual in the organizational environments, but it is hard to identify precisely the context in which this subject appeared in terms of industrial organizations (ROMANINI, 2007).

Sustainability was mentioned for the first time by John Elkington in 1987. This matter was evident, mainly due to environmental questions, having as highlight the global warming effects.

The sustainability concept, according to Elkington (1998), ensures that the current actions must not impose limits to the reach of economic, social and environmental choices for the future generations.

Labodová (2004) says that making an entrepreneurship sustainable means decreasing the impact in an economically viable manner, using preventive approaches along with the continuous improvement principles. Fresner and Engelhardt (2004) complement this concept, highlighting three dimensions on which companies must focus: the social, the ecological and the economic ones, called, in English, triple bottom line (Figure 2).

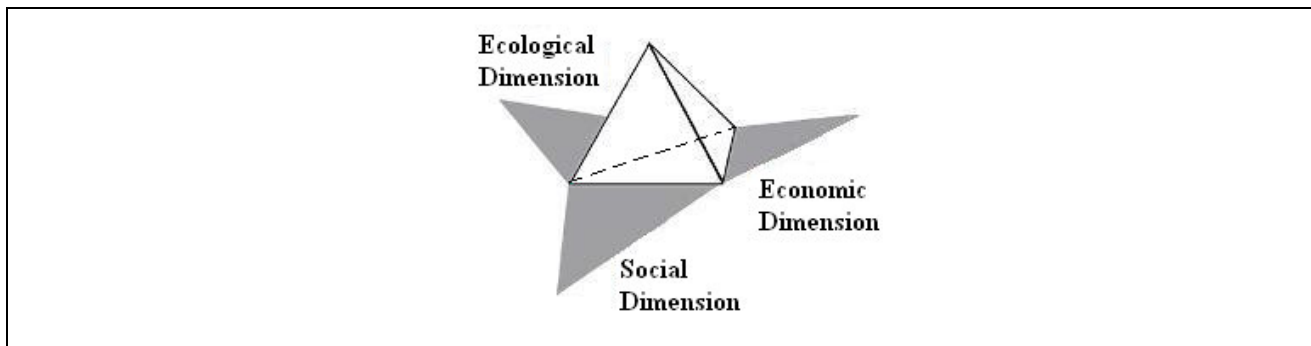


Figure 1 - Sustainability Dimensions (adapted from Fresner and Engelhardt, 2004)

- Social Dimension – highlights as main goal the guarantee of workers’ rights, promoting the continuous improvement of current working conditions through the attention of the company with the worker, and through the establishment of adequate health and safety conditions. It also involves the effective commitment of stakeholders, contributing for a proactive participation of several sectors, like the company, the employees, the unions, the clients, the government, NGOs, among others (SAI, 1997).

- Economic Dimension – denatures the future perspective guided by the constant growth expectancy and which involves the concept of innovation as an indispensable element for its realization. Realizing it necessarily means showing that many truths, conventionally accepted in the industrial and economic field, are neither objective nor undebatable (SILVA *et al.*, 2006).

- Ecologic Dimension – may be understood as the capacity of a certain population to occupy a certain area and explore its natural resources without threatening, as time goes by, the ecological integrity of the environment (LIMA and POZZOBON, 2000).

Sachs (1990) has defined sustainability as a “dynamic concept which takes into account the growing needs of populations in an international context in constant expansion”. For the author, sustainability would have as base five main dimensions, which would later be complemented by four others, adding up nine dimensions: social,

economic, ecological, geographic, cultural, environmental, territorial, national politics and international politics (SACHS, 2000).

In this scenario, Librelotto and Ferroli (2007) state that sustainability is characterized by interdisciplinarity, that is, only through the integration of different disciplines and knowledge branches we may obtain viable products that fulfill the demands of a market in constant evolution.

Bansal (2005) states that a company, for expressing its sustainability, should have: environmental integrity, social equality and economic prosperity.

One of the ways to make a system sustainable is performing its management in an integrated way, that is, involving economic, ecological and social dimensions. This fact may be reached by integrating the company's management systems; they are commonly managed by normative standards, like the example of standards for implementing Quality, Environment, Social Responsibility, Occupational Health and Safety Management Systems (SATOLO, E. G., 2008).

According to Fresner and Engelhardt (2004) the centralized management of a system allows to comprehend the employees' needs and define goals, enabling improvements on training, communication, quality and service guarantee, fulfilling requisites necessary for a sector's sustainability.

Nonetheless, measuring the organizational sustainability is not something easy due to the few works presented on the literature related to the theme, and these studies present final research data, being impossible to analyze the company using this methodology.

4. SURVEY METHOD

The case study(ies) as an empirical investigation shows a recent phenomenon inside a real life context, especially when the limits between the phenomenon and the context are not clearly defined, being the investigation a technically unique situation. Another characteristic of this kind of study is the existence of a great number of interest variables, and, as a result, they end up being based on several evidence sources and they benefit from the previous development of theoretical propositions for conducting the data gathering and analysis (YIN, 2001; MIGUEL, 2007).

Considering the survey's purpose, the present work has the characteristics of a case study as a theory construction, as it identifies and describes the key-variables, when the connections and reasons of relationships between the variables being studied are identified (VOSS *et al.*, 2002). Typically, this kind of survey is based on the application of questionnaires in order to perform a triangulation, that is, usage and combination of different methods for studying the same phenomenon (VOSS *et al.*, 2002; MIGUEL, 2007).

According to Miguel (2007), the conduction of a case study happens by means of six main stages, which were adopted for doing this work. These stages are shown on Figure 3 and will be detailed in the topics to come.

The selection of the case to be studied in this work was restricted to companies located in Sao Paulo State. The decision of restricting the survey may be justified by the analysis of data gathered by CONAB – National Provision Company (2006), an organization linked to the Agriculture, Fishing and Provision Ministry, about the sugar cane production for the 2005/2006 harvest with 370 sugar mills and alcohol distilleries throughout the country. The results show that Sao Paulo State is the “Agribusiness Locomotive” (MASCARIN, 2006; HERRERA *et al.*, 2005).

Table 1 shows some comparative data that reaffirm the importance of Sao Paulo State in this segment.

Table 1 - Comparative on the Brazilian sugar-alcohol complex and also in Sao Paulo State – Based on year 2006 (IDEA, 2007; UNICA, 2007)

Factor	Brazil	Sao Paulo State	% State SP/Brazil
Number of installed mills	325	163	50,15%
Number of projected/under development mills	73	29	39,73%
Sugar cane production (million tons)	426,0	264,3	62,04%
Area cultivated with sugar cane (million hectares)	5,90	3,15	53,39%
Average Productivity (ton per hectare)	74,30	84,40	---
Sugar Production (million tons)	29,60	19,50	65,88%
Alcohol Production (billion liters)	17,70	10,90	61,58%
Direct jobs (in thousands – year 2003)	~1.000	~400	---

Source: IDEA, 2007; UNICA, 2007

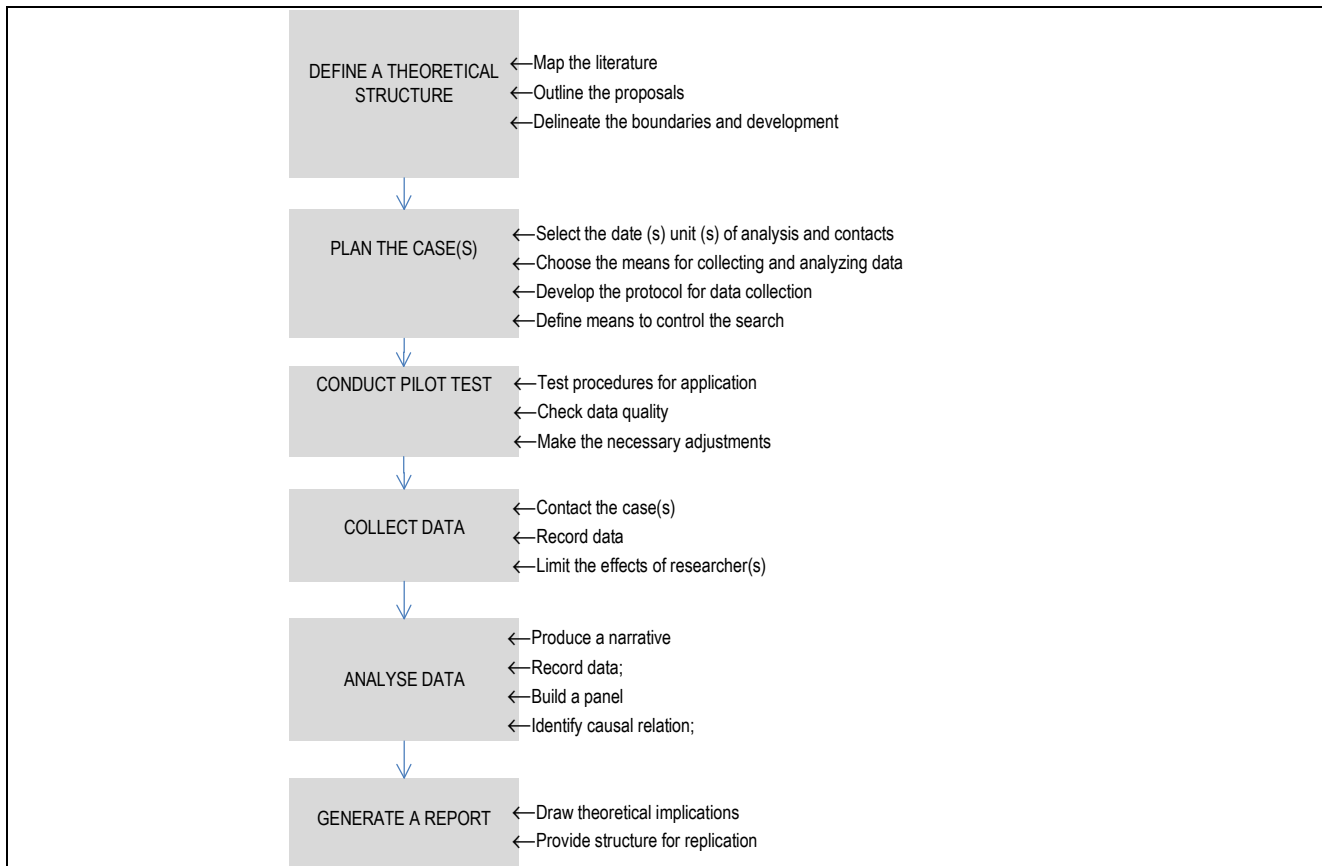


Figure 2 - Stages for conducting the case study (MIGUEL, 2007)

According to Mascarin (2006) this leadership still presents a high growth potential through the integration between bioethanol and biodiesel, using existing synergies for producing these cultures, both in agricultural, industrial and logistic aspects.

Piracicaba City is located in Sao Paulo State and it is considered a sugar cane technological “barnyard” for possessing major research and technology centers (MORENO and CARLO, 2007). This reference is also given by the development of ethanol, gathering the most important links in this productive chain: cultivation areas, research centers and industries in this segment (GODOY, 2007). Thus, the region gathers what is called the Alcohol Local Productive Arrangement (APLA).

4.1. The survey questionnaire

The survey questionnaire, elaborated for the data gathering, was divided into three sections: characterization of the interviewee, characterization of the analysis unit and evaluation on the organizational sustainability level for the Survey Unit.

The pilot test, performed to validate the developed questionnaire, happened by means of the conduction of three applications. The criteria used for selecting the interviewees were defined in this way: a professional linked to the activities related to the production management, who works in the research sector, in order to evaluate aspects related to the SGI and the need of adaptations for the research sector; a professional linked to the activities related to the production management in companies, who is responsible for implementing the SIG in the company, in order to verify aspects related to the SIG itself; a professional linked to academic and consulting activities, in order to approach the matters under a scientific point of view.

The professionals who evaluated the survey questionnaire gave improvement suggestions for formulating the questions, adapting the language and the inclusion of important aspects that must be issued for the surveyed sector.

Thus, the questionnaire for evaluating the organizational sustainability degree reached its final elaboration. Made up of 10 statements, the questionnaire contemplated the three sustainability dimensions (ecologic, social and economic). For answering these statements, the interviewee had a 10-point Likert scale (0 to 10) where zero meant “does not perform” and ten meant “performs thoroughly”.

5. SURVEY RESULTS

In this section, we present the results of the data gathering in the survey unit, and these are divided into two parts: company/interviewee characterization and the organizational sustainability evaluation results.

5.1. Company/Interviewee Characterization

The Survey Unit is characterized as the major Brazilian individual sugar-alcohol group, occupying a highlight position in the international scenario. The group is the biggest sugar cane producer and processor, second biggest alcohol producer and the biggest alcohol exporter, as well as the world's third biggest sugar producer. The company has 19 producing units, two refineries and two harbor distribution terminals, besides three industrial units being built.

The unit under analysis was founded in 1936, with 4,000 employees and a total installed capacity for grinding 24,000 tons of sugar cane, producing 41,500 sugar sacks and 1,250 thousand liters of alcohol daily. In relation to the process of producing ethanol, the company implemented the technology of molecular sieves, allowing the production of anhydrous alcohol without the need for using the dehydrator cycle-hexane, allowing the production of a purer, non-polluting product.

The bagasse resulting from the grinding is used as fuel for the boilers to produce steam and this biomass is a product with such a high potential for complementing the generation of electricity, and in 2006, the company traded over 32.5 thousand MW/h coming from this process of energy co-generation.

In terms of indicators for the productive performance, the organization shows growth on the sugar and ethanol production in recent years, and in the period 2001-2006, the fabrication of sugar passed from 1.2 million to 3.24 million tones and the alcohol production passed from 354 thousand cubic meters to 1,266 thousand cubic meters.

The interviewee in this unit was the group's Quality Coordinator, who has worked in the unit for 7 years.

5.2. Evaluation of the organizational sustainability

As previously described, the evaluation of the organizational sustainability was measured using 10 statements that contemplated the three sustainability dimensions (ecologic, social and economic).

The evaluation results (marks) for the organizational sustainability in the survey unit are present on Figure 4. As it follows, some individual aspects for each of the evaluated elements are described.

Element 1 – *The strategy for growth and product development takes into account the problems related to the global warming* – the company currently considers and is aiming its actions seeking to generate new environmentally friendly products. Besides the ethanol, which already has this ecologically correct idea, the survey unit has made efforts at generating new production processes, like the molecular sieves in the alcohol production. Another growth potential where the survey unit has invested is the development of energy co-generation from the sugar cane bagasse burning.

Element 2 – *There is the commitment with social, environmental and economic causes related to the planet maintenance and its resources in the future* – the company has a set of activities, which try to promote the society welfare and help to recover the environment. These are social actions, like educational programs for children and adolescents; environmental actions, like reforestation programs, preservation of rivers and the air, and selective garbage collection.

Element 3 – *The company has a culture of diminishing residues and controlling the natural resources waste* – the survey unit has got, in its industrial environment, a sewage treatment station (ETA), besides encouraging and spreading the reduction of productive resources.

Element 4 – *The company publishes a report on the organizational performance in an open, objective and organized way* – the company has not got any kind of document/report yet, which allows the interested parties to follow the company's organizational performance, either financial or about actions developed by it. According to the interviewee, there is only an internal report for the staff.

Element 5 – *The company directors follow the speech directed to their public and are committed with its implementation* – the company has support from the board of directors for implementing its socio-environmental actions. One of the difficulties mentioned by the interviewee is that, due to the presence of several producing units, it gets hard to have a close contact that may show the support to the system, making this aspect more difficult to be perceived by the staff.

Element 6 – *There is either an area or a person responsible for matters linked to the social responsibility, environment and safety and occupational health* – the company has a complete department that is responsible for these three areas. Proof of that is the existence, within the company, of a formalized and participative Management Integrated System. The SIG performs the unification of several management systems in the

organization and brings several benefits for the organization, among which: getting rid of duplicity and redundancies; harmonizing and simplifying documentation; simplifying standards and requisites for the organization's management system; reducing costs etc.

In the survey unit, the SIG contemplates four areas: quality, environment, safety and occupational health and social responsibility. The interviewee highlights some points on the system's policy:

1) Commitment with: client satisfaction; realization of food safety practices on the products for human or animal consumption; prevention and control of environment pollution; maintenance of activities and a safe and healthy work environment;

2) Responsibility: growth with responsibility and sustainability;

3) Integrity: at meeting the pertinent legislation and other agreed requisites;

4) Excellence: is based on the continuous improvement of the management systems.

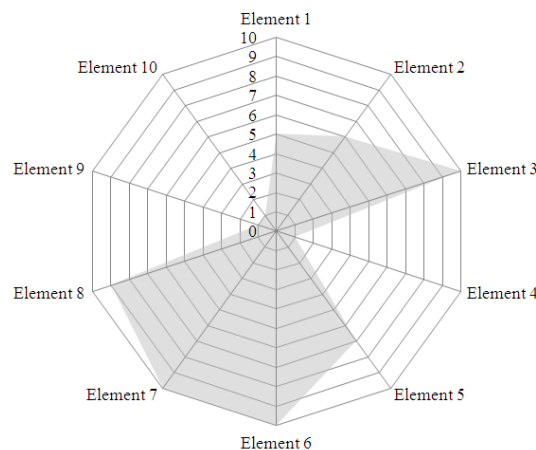
Element 7 – *There is a structured policy – and with current actions – of socio-environmental responsibility, like, for instance, at selecting suppliers* – the company, as already described he

rein, has several socio-environmental actions in course. Strictly mentioning the selection of suppliers, the company has special care at diagnosing suppliers for the manual sugar cane cut, because it is a wrecking job and may have direct impacts on the staff health, in case measures of occupational health preservation are not strictly obeyed.

Element 8 – *There are structures for receiving and registering complaints or demands from the affected public (either in a direct or indirect way) because of its operations, products or services* – the company has several open channels for receiving these, including internet and a phone service.

Element 9 – *The goals defined by the company has a risk management plan, which considers short, medium and long-term socio-environmental aspects* – the survey unit has not got risk management plans yet.

Element 10 – *The company manages how its operations may be affected by either climate variations, behavior of the community in which it is inserted or happenings related to its actions and it may adapt to these risks – including the financial implications* – the survey unit does not perform the management of its operations.



Legend

Element 1 - The strategy for growth and product development takes into account the problems related to the global warming

Element 2 - There is the commitment with social, environmental and economic causes related to the planet maintenance and its resources in the future

Element 3 – The company has a culture of diminishing residues and controlling the natural resources waste

Element 4 - The company publishes a report on the organizational performance in an open, objective and organized way

Element 5 - The company directors follow the speech directed to their public and are committed with its implementation

Element 6 - There is either an area or a person responsible for matters linked to the social responsibility, environment and safety and occupational health

Element 7 - There is a structured policy – and with current actions – of socio-environmental responsibility, like, for instance, at selecting suppliers

Element 8 - There are structures for receiving and registering complaints or demands from the affected public (either in a direct or indirect way) because of its operations, products or services;

Element 9 - The goals defined by the company has a risk management plan, which considers short, medium and long-term socio-environmental aspects

Element 10 - The company manages how its operations may be affected by either climate variations, behavior of the community in which it is inserted or happenings related to its actions and it may adapt to these risks – including the financial implications

Figure 3 - Evaluation of the organizational sustainability

6. CONCLUSIONS

The results show that the company already has a corporate structure responsible for addressing issues relating to sustainability, especially the social responsibility, environment and occupational safety and health, being disseminated in the organization's culture of waste reduction, control of natural resources and a policy for receiving and recording of complaints, suggestions or demands of the people affected by its operations, products or services. However, the research also indicated aspects to be improved with the corporative sustainability goal. The strategic planning and the concern of top management are key points that need better structuring, through the promotion of strategies for growth and development of products that take into account the problems related to global warming. Similarly, the knowledge diffusion and sustainable growth culture should start from the top level organization commitment. The conducted research has draw a view of the sustainability of an Brazilian sugar-ethanol company, which is highlighted by its role on the world biofuels production. The results highlighted that is still at an early stage as to the sustainable management, being evidenced by the low commitment of top level management and uncertainty about the goals and actions to be performed in order to establish the culture for the sustainability in the organization.

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