Sustainability Strategies and Actions in Firms from the Brazilian Sugarcane Industry Participating in the Clean Development Mechanism (CDM) in view of the Triple Bottom Line Elkington

Abstract

This study aimed to identify the sustainability strategies of companies in the Brazilian sugarcane industry participating in the Clean Development Mechanism. Desk research was used, and the sources were the data of GRI reports and websites of 18 groups of companies, controllers of 48 mills. The results indicated that the most indicators reported by the mills refer to initiatives and strategies connected with protection and preservation of the environment. This research found several actions developed by the mills with the intention of preservation and environmental protection, and also an association between sustainability practices and the financial performance.

Introduction

High economic growth during the Industrial Revolution brought with it great ecological impacts, such as costs of environmental disaster, air and water pollution, farmable lands degradation, wars, economic and social injustice, human displacement and diseases. Awareness of these costs by business organizations has increased significantly over the last 25 years, especially, among other factors, because of the growth of environmental activism, regulation and democratization (Stead & Stead, 2000). Sustainability or sustainable development has become important matters within the political and organizational agendas (Moneva, Archel, & Correa, 2006). Also the notion of measurement related to the Triple Bottom Line has become popular among consultants and organizations (Norman & Macdonald, 2004). The Triple Bottom Line concept assumes that a company success should be measured not only by the traditional financial results, but also for its social / ethical and environmental performance (Norman & Macdonald, 2004).

A growing number of researches on corporate sustainability have focused on sustainability reports released by the organizations and the organizations' motivations to do and disclosure these reports (Roca & Searcy, 2012). By doing disclosure of information on corporate social responsibility, economic, social and environmental concerns, companies aim to meet new forms of governance and interests of governments and financial markets in sustainability reports and sustainable development (Gallego, 2006). Taking in consideration all these facts, many researches and consulting companies have started to offer services for organizations that want to measure their results, to audit and prepare reports about its social and environmental performance (Norman & Macdonald, 2004).

One significant initiative for developing a framework for sustainability reports, aiming at the quality of the companies' socio environmental performance disclosure, was developed by the Global Reporting Initiative (GRI). The GRI is the result of a project of the Coalition for Environmentally Responsible Economies (CERES) with the United Nations Environmental Program which published the first guidelines for sustainability reporting in June 2000 (Moneva, Archel, & Correa, 2006). The aim of the GRI guidelines is to "to help reporters prepare sustainability reports that

matter, contain valuable information about the organization's most critical sustainability-related issues, and make such sustainability reporting standard practice" (GRI, 2015, p.3).

These facts are applied to the most diverse types of organizations that use sustainability reporting, among them Brazilian mills of the sugar and ethanol industry. Brazil has an area of 851 million hectares, in which 376 million are farmable lands, of which 5 million have been used for sugarcane crop, representing 1.3% of the sugarcane production in the available area (Germek, et al., 2013). In addition, the job creation by the Brazilian sugarcane industry is very representative, reaching people from different social classes and geographically distributed throughout the country. It is an important part of the agribusiness chain in Brazil, involving companies that produce capital assets, producers of inputs, training facilities and improvement of manpower, research institutions, transportations systems and educational institutions. This industry contribute directly and indirectly to improve people's life quality competently and with social responsibility (Germek, et al., 2013).

In this context this work has as main objective to identify the sustainability strategies of the Brazilian sugar and ethanol mills industry that participate in the Clean Development Mechanism (CDM) in view of the Triple Bottom Line of Elkington. In order to guarantee that this objective is achieved, we defined the three following specific objectives: to measure the results of the mill's practices regarding social and environmental dimensions; to identify the practices undertaken by the mills aiming at environmental preservation and protection; to identify the relationship between sustainability practices and financial performance of these organizations;

Theoretical Framework

Brazilian Sugar and Ethanol Industry

The activities of the Brazilian sugar and ethanol industry have some centuries of history, and this industry rose to prominence at the peak of the sugarcane cycle in colonial Brazil in the XVI century (Pacheco & Hoff, 2013). Afterwards there was a decline in the importance of this industry to the economy. Its activities regained relevance only in the late twentieth century and the main cause of this return was the 1970 oil crisis. The most critical time of this process occurred in 1973, when, in retaliation against the United States and some European countries' position in the War of Yom Kippur (Day of Atonement). That shock was so great that the barrel price rose about 400% in three months (IPEA, 2010).

Seeking to react to these events, in the 1970s and 1980s some macroeconomic policies were implemented in Brazil aiming to create programs for technological innovation, such as the National Alcohol Program - PROÁLCOOL (Conab, 2013; Pacheco & Hoff, 2013). These actions helped the evolution of production techniques and use of new technologies in the industry and still in the 1980s the ethanol production in industrial scales started (Pacheco & Hoff, 2013). A large domestic market was created for ethanol and Brazil ended up by developing a model of mixed industry,

unique in the world for that time, by allocating a portion of the sugar cane juice to produce sugar and another portion for ethanol manufacturing (Conab, 2013). However the government incentives for the sugarcane industry began to decline in the second half of the 1980s, with the extinction of the IAA (Sugar and Alcohol Institute) accomplished in 1991 (Barros, 1996).

The industry started to benefit once again from the technological and institutional evolution only in the 2000s (Pacheco & Hoff, 2013), among other reasons, as a result of the concern about the increasing air pollution and the signing of the Kyoto Protocol in 1998. Nowadays the Brazilian biofuel industry is the most developed and integrated in the world and the Brazilian liquid biofuels are known worldwide. Bioethanol, which comes from sugar cane, is especially important, among other reasons, for a technical and economic point of view, it is easier and much cheaper to produce bioethanol from sugar cane than from corn such as in the USA (Pippo & Luengo, 2013). According to Pacheco & Hoff (2013) the new laws governing the industry and the pressures for the use of cleaner forms of energy led to many advances in the industry, such as: a) gains in productivity in the sugarcane, ethanol and sugar production; b) expansion of demand for fuel and sugar because of the advent of automotive engines type flex and the change in the food consumption profile in many parts of the world; c) evolution of the processes involved in the production chain, contributing to a more efficient and cleaner production pattern, such as the reuse of by-products within the own chain, reducing environmental externalities; and d) diversification of the products derived from sugar and ethanol production chain, with more sophisticated products such as the cellulosic ethanol, yeast, polymers, solvents and carbon credits - allowed thanks to the institutional evolution in the field of environmental protection.

Brazilian Sugar and Ethanol Industry and the Clean Energy Production

The cycle to ethanol and sugar cane removes about eight times the CO_2 it produces, while gasoline releases into the atmosphere three tons of CO_2 per ton of fuel without any environmental compensation besides producing more aggressive pollutants (Eston, 1990 cited Germek, et al., 2013).

Another relevant issue is the interaction of mills with the environment regarding the production of electric energy through the use of sugarcane bagasse. First there is the potential to make the facility self-sustaining (Pacheco & Hoff, 2013). In addition, there is the possibility of the mills to co-generate electric power, working together with the national distribution system (Pacheco & Hoff, 2013). In the future, sugar and ethanol mills can become islands of alternative energy production through using the total sugarcane and its by-products (Germek et al., 2013). In a study published in 2013 by Germek et al., it was estimated the potential values that the sugar industry could offer with its biomass to generate electricity (Bioelectricity). The results it is showed that the mills in Brazil could produce 5.7 to 7.3 MWH which is equal to 45-58% of the Itaipú Hydroelectric Power Plant potential.

Clean Development Mechanism (CDM)

The establishment of the Kyoto Protocol, signed in 1997, sought the commitment of the signatory countries to reduce the emission of greenhouse gases (GHG) in the atmosphere (Brazil, 2014). The latest text of the Protocol however foresees cuts of 25% to 40% in the developed countries emissions by 2020, based on the 1990's levels (Brazil, 2014). Among the many commitments to be undertaken by the signatory countries the ones that most stand out were: a) increase of energy efficiency in relevant industries of the economy; b) research, development and increase of renewable energy use, use of Carbon dioxide (CO_2) capture and sequestration (CCS) technologies and use of environmentally safe technologies; c) conducting of promotion policies and of measures that limit or reduce the emissions of greenhouse gases; d) actions to limit and / or reduce emissions of greenhouse gases in the transportation industry (Brazil, 1997). However the developed countries have had some difficulties in achieving the set targets, mainly because of the high cost to carry out the reductions in their countries. For this reason there were created alternative ways to allow to be able countries to fulfill their part in the agreement. It was established three additional mechanisms to complement measures to reduce the emissions of greenhouse gases by the signatory countries: the Clean Development Mechanism - CDM; the Joint Implementation; and the Emissions Trading - ET (Frondizi, 2009).

The Climate Change Department of the Ministry of Environment (MMA) explains that the CDM allows the developing countries to benefit from the activities of reducing the greenhouse gases emissions, and subsequently sale the Certified Emissions Reductions (CERs) (Brazil, 2014). These credits (CERs) can be sold or traded with developed countries that have the obligation to reduce the greenhouse gases emissions, but whose emissions are still above the limits agreed under the Kyoto Protocol, The CDM serves as a tangible mean to help developing countries to use the resulting CERs to achieve their reduction goals (Lloyd & Subbarao, 2009).

The contributions of CDM project activities for the sustainable development are evaluated by several criteria such as: a) contribution to local environmental sustainability; b) contribution to the development of working conditions and job creation; c) contribution to income distribution; d) contribution to technological empowerment and development; e) contribution to regional integration and to the sectorial relationships (Brazil, 2014). But Tte CDM also has a series of requirements to be developed, the emissions reductions must be measurable and quantifiable, as well to provide an improvement compared to a pre-defined baseline. The baseline is the expected trajectory of the emissions in the absence of the project (Silveira, 2005). The project's activities need to show real, measurable and long-term benefits and demonstrate the emissions reductions of greenhouse gases or the increase in the CO_2 removal from the atmosphere (Frondizi, 2009). The characteristics of CDM projects can be seen in Figure 01:

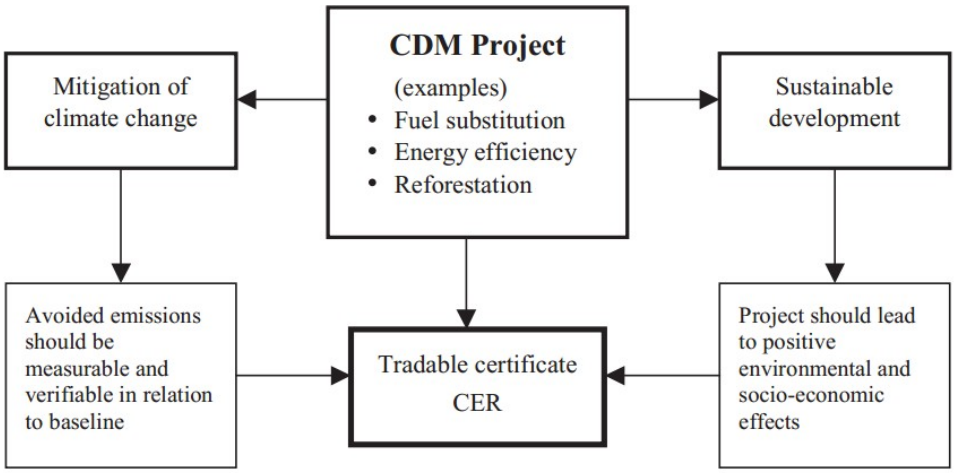

Figure 1. Characteristics of CDM projects

Source: Silveira (2005, p. 109).

In this context, bioenergy, such as that produced by the sugar and ethanol mills in Brazil, stands out as an attractive option. Being capable of meeting the socio-economic requirements imposed on CDM projects and contribute to climate change mitigation objectives (Silveira, 2005).

Triple Bottom Line and Corporate Sustainability

The most accepted definition of sustainable development is the one proposed in the Brundtland Report (WCED, 1987), which defines it as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Moneva, Archel, & Correa, 2006), this definition refers to equality (intra and intergenerational justice). First, it implies that the decisions taken today should not restrict possible decisions in the future (Will, 2008).

For the organizations this implies, for example, in reducing the consumption of non-renewable resources or even the abdication of a business possibly profitable for ethical reasons (Will, 2008). Indeed, the growing interest of legislators, local communities and the market (green consumers) in the ecosystem and the need to reduce the use of natural resources has compelled managers to improve the environmental performance of their companies (Azzone, Bertelè, & Noci, 1997).

It is in this context that the concept of Triple Bottom Line arises; this management vision assumes that the company's success should be measured not only by the traditional financial results, but also for its social / ethical and environmental performance (Norman, & Macdonald, 2004). Its defenders believe that the social and environmental performance can be measured in a very objective way, and that companies should use these results to improve their social and environmental performance (Norman, & Macdonald, 2004). Actually, according to Idowu and Towler (2004

apud Gatti & Seele, 2014) sustainability reports are vehicles used to show the companies concerns, they show how they have been acting in relation to social and environmental issues as well as how they want to act in the future.

Global Reporting Initiative (GRI)

The Global Reporting Initiative (GRI) is a non-profit organization headquartered in Amsterdam, the Netherlands, though it was founded in Boston in 1997. Operating on an international level, the GRI is considered a widely accepted initiative, also being the most important in terms of social and environmental disclosure (Waddock, Bodwell, & Graves, 2002). The GRI has developed a framework for sustainability reports that can be adopted by organizations of different sizes, industries and countries (Global Reporting Initiative, 2015).

Its founders aimed that the GRI would become a platform for a widely participative dialogue about what constitutes the organizations' sustainability performance. The founders' strategy was: a) to mobilize a broad coalition of participants who had not previously thought of themselves as members of the sustainability movement and engage them in a discussion around a set of rules, practices and guidelines of the GRI reports; b) to create a mechanism to keep the discussion working in the future and build a sense of shared ownership of the new rules and practices; and c) to create an organization which would serve as the guidelines and the GRI evolutionary process manager (Brown, Jong, & Levy, 2009).

The GRI framework in its latest version consists of general and specific standard content. The standard general contents are: Strategy and Analysis; Organizational Profile; Material Aspects Identified and Limits; Stakeholder Engagement; Report Profile; Governance; Ethics and Integrity. The standard specific contents are: Information on the Management Approach; and Indicators. GRI has more than seventy indicators, which are organized into economic, social and environmental dimensions (Global Reporting Initiative, 2013).

Although the framework is very detailed, its adoption is voluntary. So when preparing its sustainability report, each company decides which indicators it will report. The GRI framework provides guidance on how organizations can disclose their sustainability performance with directives, protocols, industry supplements, a detailed list of performance metrics and other items (Toppinen et al., 2012).

MATERIALS AND METHODS

In this context, the main goal of this work is to identify the sustainability strategies of the Brazilian sugar and ethanol mills industry that participate in the Clean Development Mechanism (CDM) in view of the Triple Bottom Line of Elkington. Considering its objective, this work was classified as a descriptive and exploratory research (Cervo & Bervian, 1996). The research method was the documental research, as a main source of data we used was the GRI

reports released by mills groups in Brazilian sugar and ethanol industry that participate in the Clean Development Mechanism. In order to complement the financial information, we also consulted the selected groups' websites.

In order to identify the practices developed by the mills that aimed environmental preservation and protection we used the technique of content analysis, which seeks to describe, through systematic procedures (Bardin, 2011). In the pre-analysis phase we conducted a brief reading of the 25 available reports. After this initial reading of the reports we decided to withdraw 7 reports from the analysis.

From the initial set, 8 reports were of different mills, but they belonged to the same group of companies, all information disclosed in each one of these reports referred to all mills of the group, so all the information was repeated. For this reason only one report from each of these groups was used, resulting in the exclusion of five of reports. It was also excluded another report, because it brought only the information related to one of the GRI indicators and did not refer to the mill itself. The last report we excluded was one of the Raizen Group reports, considering the large number of mills included (23 mills) it could be considered an outlier, being so we decided to exclude this report from the research. The Raizen Group's report concerning Usina Tarumã 2 was held because it was related to only this mill individually. So, for the results analysis we used GRI reports of 18 groups of companies, controllers of 48 mills, and each group holds control between 1 and 7 mills.

In addition to the data obtained in the sustainability reports, we also sought to define a financial performance variable of the mills. The financial performance variable selected was the net revenue, as it was available to a larger number of companies. For those companies that did not provide the net revenue in the sustainability report, we obtained the information on their websites and also on the website of the Best and Largest of Exame Magazine (Exame, 2014).

Another data analysis technique used was the cluster analysis. The companies were grouped together according to the environmental and social performance, achieved through the frequency of indicators responded in each of these two dimensions. After the grouping, we verified the difference of mean among the groups with the analysis of variance technique (ANOVA). The analysis was performed with the support of the SPSS software.

RESULTS AND DISCUSSION

Analysis of information disclosure in the environmental dimension

In an initial analysis of the environmental and social dimensions of the GRI, information is organized using the information report of indicators by the groups of companies. To classify if each indicator is reported or not, we compare the indicator description on the G4 - Guidelines for Sustainability Reporting (2015) and the information disclosed by the group. It is regard as reported if the information disclosed by the group meets, at least partially, the indicator description requirements. The information report of the environmental dimension by indicator can be seen in Table 01:

Table 1. Information report by indicator - Environmental

Indicator	Quantity of information presentations	Indicator	How many times the information was reported
EN1	2	**EN15**	2
EN2	1	**EN16**	4
EN3	3	**EN17**	4
EN4	0	**EN18**	13
EN5	0	**EN19**	1
EN6	10	**EN20**	2
EN7	7	**EN21**	1
EN8	4	**EN22**	3
EN9	4	**EN23**	1
EN10	4	**EN25**	1
EN11	7	**EN26**	1
EN12	12	**EN29**	1
EN13	14	**EN30**	3
EN14	12		

From a total of 27 possible indicators and 18 company groups, each group reported, on average, 4.33 indicators, with standard deviation of 4.25. Only about 15% (4 indicators) has information reported by 10 or more companies. The indicators most frequently reported can be seen in Table 02:

Table 2. Indicators most frequently reported - environmental

Indicator and Description	How many times the information was reported
EN6 - Calculate or estimate the energy saved by initiatives to reduce energy use and increase energy efficiency.	10
EN12 - Identify significant positive and negative impacts on biodiversity associated with activities, products, and services of the organization, including both direct impacts as well as indirect impacts (such as in the supply chain).	12
EN13 - This Indicator refers to areas in which remediation has been completed or the area is actively protected. Areas in which operations are still active can be counted if they conform to the definitions of ’restored’ or ’protected’.	14
EN14 - Identify the location of habitats affected by the operations of the organization that include species on the International Union for Conservation of Nature (IUCN), Red List of Threatened Species, and on national or regional conservation lists.	12
EN18 - Select an appropriate ratio denominator to represent per unit output, activity, or any other organization specific metric.	13

It is possible to notice that all indicators of higher frequency are related to the organizations initiatives and strategies for environmental protection and preservation, these indicators do not report exactly the quantitative results. Therefore, it becomes difficult to measure the real impact of these initiatives on the organizations sustainability. Despite

this problem, the accomplishment of activities related to the environment protection and preservation are consistent with the participation of these organizations in the CDM, as a mean to obtain the Certified Emission Reductions (CERs).

As for the report by group of companies, the Group Louis Dreyfus Commodities, which has four mills, has the highest disclosure index (number of indicator reported) with report of 15 indicators. Close behind are the Usina Alto Alegre Group S/A with four mills and 11 indicators and Zilor Group with 3 mills and 10 indicators. All the results of the report by group of companies can be seen in Table 03:

Table 3. Number of indicators reported by group of companies – environmental dimension

Company	**Nº of mills**	**Number of indicators reported**
GRUPO LOUIS DREYFUS COMMODITIES	4	15
USINA ALTO ALEGRE S/A	4	11
GRUPO ZILOR	3	10
GRUPO BUNGE	1	8
USINA ALTA MOGIANA	1	7
GRUPO COLOMBO 2	3	7
USINA SANTA ADELIA	3	7
GRUPO TERCIO WANDERLEY	4	6
USINA JALLES MACHADO	1	6
GRUPO RENUKA BRASIL	2	6
GRUPO BALBO	2	6
GRUPO TEREOS	7	5
GRUPO TONON BIOERNEGIA SA	3	5
USINA CAETES	4	4
USINA CERRADINHO	1	4
USINA ITAMARATI	1	4
GRUPO RAÍZEN	2	4
GRUPO PEDRA AGROINDUSTRIAL S/A	2	2

On average each group reported 6.5 indicators, with a standard deviation of 3.05. The largest group of companies in number of mills is the Tereos Group with seven plants; however they reported only 5 indicators. Apart from that, out of the analyzed groups, 6 groups reported 4 or fewer indicators. It also must be considered the negative emphasis on Grupo Pedra Agroindustrial S/A which discloses only two indicators.

Analysis of information disclosure in the social dimension

From 14 indicators in the reports of 18 groups of companies, about 28.57% (4 indicators) were reported by 10 or more groups of companies. The same amount 28.57% (4 indicators) was reported by 2 or fewer groups. The report of the social dimension can be seen in Table 04:

Table 04: Information report by indicator - Social

Indicator	How many times the information was reported
LA2	13
LA8	13
LA11	11
LA3	10
LA9	8
LA1	6
LA7	5
LA10	4
LA6	3
LA13	3
LA5	2
LA4	1
LA12	1
LA14	1

From a total of 14 possible indicators and 18 company groups, each indicator was reported on average by 4.5 company groups, with a standard deviation of 2.57. The indicators most frequently reported can be seen in Table 05:

Table 5. Indicators most frequently reported - social

Indicator and Description	How many times the information was reported
LA2 - Total number of employees and the respective turnover rate by age bracket, gender and region.	13
LA8 - Programs in education courses, training, counseling, prevention and risk control, now underway, to ensure assistance to the workers and to their families or community members affected by serious diseases.	13
LA11 - Programs for competences management and ongoing learning that support the continued employability of the employees and for the career management	11
LA3 - Benefits ensured to full-time employees that is not granted to temporary or part-time employees.	10

Once again it is possible to notice that two of the most frequent indicators are related to the organization's programs, in this case, programs related to human resource management. The LA2 indicator was reported by 13 groups, however, often incomplete, and 9 companies only reported the total number of employees. Because of the lack of quantitative result it is difficult to measure the real impact of these initiatives on the organization's resources. The results of the information report in the social dimension by group of companies can be seen in Table 06:

Table 6. Number of indicators reported by group of companies - social

Company	Nº of mills	Number of indicators reported
GRUPO RAÍZEN	2	9
GRUPO ZILOR	3	8
USINA ALTO ALEGRE S/A	4	8
GRUPO LOUIS DREYFUS COMMODITIES	4	8
GRUPO BUNGE	1	7
GRUPO COLOMBO 2	3	6
USINA CAETES	4	5
USINA JALLES MACHADO	1	5
GRUPO RAÍZEN	1	4
USINA ALTA MOGIANA	1	3
GRUPO TEREOS	7	3
GRUPO PEDRA AGROINDUSTRIAL S/A	2	3
GRUPO BALBO	2	3
GRUPO TERCIO WANDERLEY	4	2
USINA ITAMARATI	1	2
USINA SANTA ADELIA	3	2
GRUPO TONON BIOERNEGIA SA	3	2
USINA CERRADINHO	1	1

As to the report by group of companies, the Raizen Group which has two mills had the highest disclosure index with report of 9 indicators. Close behind are the Zilor Group with 3 mills and report of 8 indicators and Usina Alto Alegre Group S/A with 4 mills and 8 indicators and the Bunge Group with 1 mill and seven indicators. At the social dimension the Tereos Group also had a low disclosure index, with only 3 indicators. In addition, five groups disclose 2 or fewer indicators.

Analysis of information disclosure - social and environmental dimension

When carrying out the information disclosure crosschecking of social and environmental dimensions we try to establish a ranking using the companies with higher total frequency of indicators report. The crosschecking of the information report by group of companies can be seen in Table 07:

Table 7. The information report crosschecking by group of companies – social and environmental

Company	Environmental	Social	Total
GRUPO LOUIS DREYFUS COMMODITIES	15	8	23
USINA ALTO ALEGRE S/A	11	8	19
GRUPO ZILOR	10	8	18
GRUPO BUNGE	8	7	15
GRUPO COLOMBO 2	7	6	13
GRUPO RAÍZEN	4	9	13
USINA JALLES MACHADO	6	5	11
USINA ALTA MOGIANA	7	3	10
GRUPO RENUKA BRASIL	6	4	10
GRUPO BALBO	6	3	9

USINA CAETES	4	5	9
USINA SANTA ADELIA	7	2	9
GRUPO TERCIO WANDERLEY	6	2	8
GRUPO TEREOS	5	3	8
GRUPO TONON BIOERNEGIA SA	5	2	7
USINA ITAMARATI	4	2	6
GRUPO PEDRA AGROINDUSTRIAL S/A	2	3	5
USINA CERRADINHO	4	1	5

The average of total of indicators reported was of 11 indicators per group, with a standard deviation of 5.01. Regarding the report of environmental and social indicators combined, the ranking shows the group with the highest disclosure index is the Louis Dreyfus Commodities Group with disclosure of 23 indicators. The group ranked second group is the Usina Alto Alegre Group S/A, with 19 indicators. However 9 (50%) of the groups present which may be considered low disclosure, reporting only 10 or fewer indicators.

These highly heterogeneous and dispersed results are consistent with results from other researches about disclosure of sustainability reporting. Roca and Searcy (2012) studied a total of 94 Canadian corporate sustainability reports, the authors found in these reports 585 different indicators, and 324 indicators were used only once, 91 were highlighted by two corporations and 40 were mentioned by three corporations. Looking at the other extreme, very few indicators were highlighted in most reports: 10 indicators were highlighted in more than 20 reports, but only three of them were highlighted in up to 40 reports (Roca & Searcy, 2012). These results may indicate that the company, even in developed countries, operates similarly in the disclosure of their sustainability reports.

Identification of practices disclosed by the mills aiming environmental preservation and protection

Information regarding the groups of companies practices were obtained at the GRI reports made available by the companies, we used the following indicators of the environmental category detailed in Table 08:

Table 8. Indicators related to the practices aiming environmental preservation and protection

Indicator	**Number of Companies that report the indicator**	**%**
EN6 - Initiatives to supply products and services based on the energy efficiency or on the renewable energy sources, and reductions in the energy consumption as a result of these initiatives.	10	52,63%
EN7 - Initiatives to reduce the indirect energy consumption and the achieved savings	8	42,11%
EN10 - Total percentage and total volume of recycled and reused water.	3	15,79%
EN13 - Habitats protected or restored.	14	73,68%
EN14 - Strategies and programs, current and future, of management of impacts on biodiversity.	12	63,16%
EN18 - Initiatives to reduce emissions of greenhouse gases as well as the achieved reductions.	13	68,42%
EN25 - Identity, dimension, statute of protection and value for the biodiversity of the hydric resources and related habitats, significantly affected by water discharges and surface runoff. Aspect: Products and Services.	1	5,26%
EN26 - Initiatives to mitigate the environmental impacts of products and services and degree of reduction of the impact.	1	5,26%

Within the selected set of 18 groups of companies, there is a range of actions related to the intention of environmental preservation and protection. In order to facilitate the analysis, we surveyed the practices carried out by at least two groups of companies, which has resulted in 25 different practices. The average of practices is of 6.78 practices per group with a standard deviation of 3.19. The detailing of all practices can be seen in Table 09:

Table 9. Practices developed by the mills aiming environmental preservation and protection

Practices developed by the mills aiming environmental preservation and protection	**TOTAL**
It is self-sufficient in electric energy production	6
It exports electric energy	6
It generates electricity for own use	11
It carries out actions to reduce or eliminate the burning of sugarcane and CO2 emission	12
It has programs that give priority to product quality and efficiency, as well as to reduction environmental impacts	5
It declare to follow the environmental legislation	3
It has programs for sustainable development	4
It invests in reduction of energy consumption	3
It invests in increase of productivity	2
It invests in increase of energy production	3
It declare working with Carbon Credit (CDM)	4
It carries out recycling and reuse of water	4
It has partnerships for environmental protection and / or awareness	7
It carries out preservation or restoration of Permanent Preservation Areas (PPAs) and Private Reserve of the Natural Heritage (PRNH) or seedlings cultivation.	12
It makes identification of endangered species	4
It makes biological pest control	2
It is involved with other programs, actions and certifications for environmental preservation	8
It carries out the restocking of rivers	2
It uses filter cake in crop fertilization	4
It supports scientific researches	3
It features the Agro Environmental Protocol	6
It carries out environmental monitoring	2
It features ISO 14001 Certification	4
It features Renewable Fuel Standard 2	2

It features ISO 9001	3

We notice a wide dispersion between the numbers of practices accomplished by the companies. The Usina Cerradinho, for example, disclosed only one practice aiming at environmental preservation and protection. But the Louis Dreyfus Commodities Group disclosed 12 of 25 possible practices listed in this work. On average each practice is carried out by 4.88 groups, with a deviation of 3.03. We also researched the most common practices carried out between the groups of companies, as it can be seen in Table 10:

Table 10: The most common practice aiming environmental preservation and protection

Practice	**Number of groups that disclose the practice**	**%**
It carries out actions to reduce or eliminate the burning of sugarcane and CO2 emission	12	63,16%
It carries out preservation or restoration of Permanent Preservation Areas (PPAs) and Private Reserve of the Natural Heritage (PRNH) or seedlings cultivation.	12	63,165%
It generates electricity for own use	11	57,89%
It is involved with other programs, actions and certifications for environmental preservation	8	42,11%
It has partnerships for environmental protection and / or awareness	7	36,84%
It exports electric energy	6	31,58%
It is self-sufficient in electric energy production	6	31,58%
It features the Agro Environmental Protocol	6	31,58%
It has programs that give priority to product quality and efficiency, as well as to reduction environmental impacts	5	26,32%

The most common practices disclosed by the groups are: 1) To reduce or eliminate the burning of sugarcane and CO2 emissions; 2) Preservation or restoration of Permanent Preservation Areas (PPAs) and RPPN (Private Reserve of Natural Heritage) or seedlings cultivation; and 3) Electricity power generation for its own use.

Two practices that are worth mentioning are the reduction or elimination of sugarcane burning (a common practice in which the workers set fire to the sugarcane field to facilitate the harvest) and CO2 emissions and the preservation or restoration of Permanent Preservation Areas (PPAs) and PRNP or seedlings cultivation. For the first practice, considering the production cycle of a mill, the smaller the amount of sugar burnt, the lower the amount of CO2 released into the atmosphere. Reducing emissions also implies directly into better results for the CDM.

The power generation is also something very characteristic of the sugar cane plants. The sources of electricity power used by the mills are something promising for the future. These three practices most widespread by the organizations are strongly associated with the participation of the private industry in the CDM, mostly in the substitution of fossil energy by others of renewable sources, rationalization of energy use, forestation and reforestation activities (Frondizi, 2009).

Identification of the relationship between sustainability practices and the financial performance

The third objective of the research is to identify the relationship between sustainability practices with the financial performance of these organizations. Given the sample size, we use the exploratory technique of clusters analysis to identify clusters of social and environmental performance and to check if there is any association between socio-environmental performance and financial performance through the difference of means among the clusters.

First using hierarchical cluster analysis, shown in the Dendrogram, we analyze three clusters, grouping the companies according to the total indicators of the social and environmental dimension, shown in Figure 02.

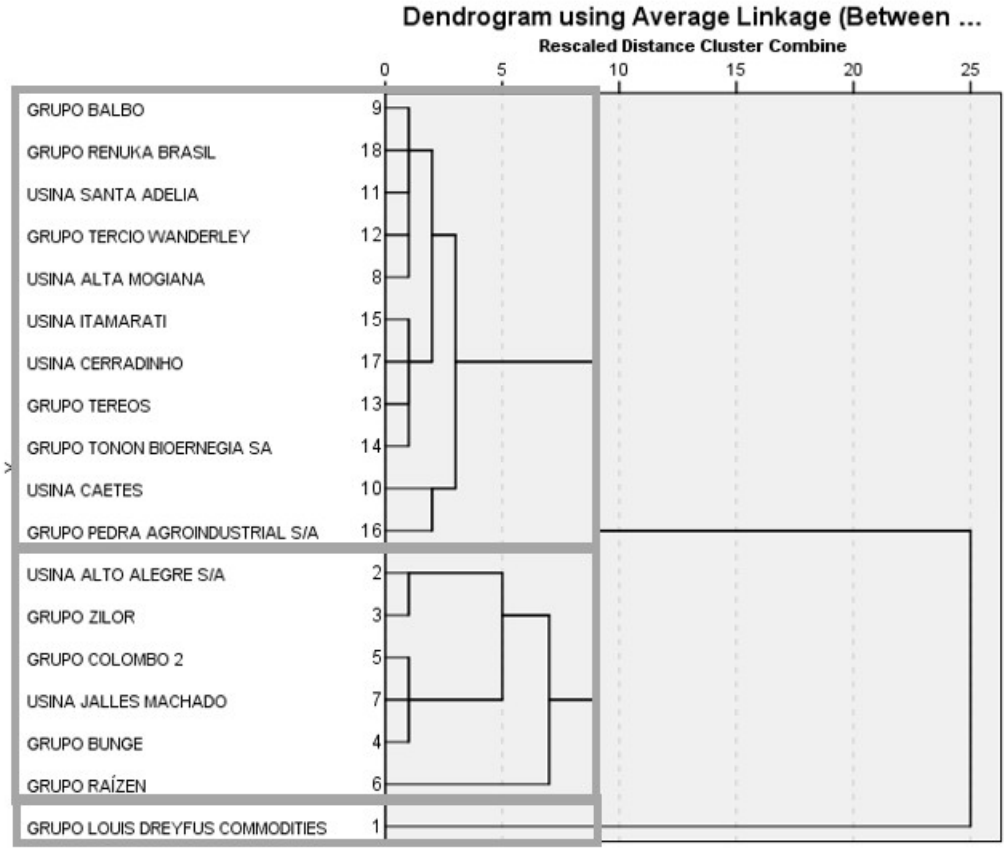

Figure 2. Dendrogram applying connection through the average
Resized distance of the Cluster

The first cluster contains only one company, the second contains six companies and the third, eleven companies. It was applied the ANOVA technique, to investigate the differences of the financial variable mean, as well as of the environmental and social variables along the groups. The results reveal that there are differences of mean between, at least, two clusters for the three variables, at the level of significance of 5%. The results are shown in Table 11.

Table 11 - ANOVA

		Sum of squares	Degrees of freedom	Mean square	F	**Sig.**
Environmental	Between groups	102,258	2	51,129	13,636	**0,000**
	Within groups	56,242	15	3,749		
	Total	158,500	17			
Social	Between groups	89,485	2	44,742	29,161	**0,000**
	Within groups	23,015	15	1,534		
	Total	112,500	17			
Finance	Between groups	1,496E+19	2	7,481 E+19	5,704	**0,018**
	Within groups	1,574 E+19	12	1,311 E+19		
	Total	3,070 E+19	14			

The differences of mean can be observed through the clusters descriptive statistics and through the graphs, as shown in Table 12 and Figure 03. It is noteworthy that the environmental and social variables refer to the number of reported indicators and the variable financial performance refers to net revenues, and therefore are numbers with more digits. Because there is no comparison among the variables, only among clusters, there was no need to standardize them.

Table 12: Descriptive Statistics of the clusters

		N	Mean	Standard deviation	Standard Error	Minimum	Maximum
Environmental	*Cluster* 1	1	15,0000	.	.	15,00	15,00
	*Cluster*2	6	7,6667	2,58199	1,05409	4,00	11,00
	*Cluster*3	11	5,0909	1,51357	0,45636	2,00	7,00
	Total	18	6,5000	3,05345	0,71970	2,00	15,00
Social	*Cluster* 1	1	8,0000	.	.	8,00	8,00
	Cluster 2	6	7,1667	1,47196	0,60093	5,00	9,00
	Cluster 3	11	2,7273	1,10371	0,33278	1,00	5,00
	Total	18	4,5000	2,57248	0,60634	1,00	9,00
Finance	*Cluster* 1	1	4209850000,00	.	.	4,21E+009	4,21E+009
	Cluster 2	4	2050445375,00	2184993774,18	1092496887,09	3,97E+008	5,26E+009
	Cluster 3	10	646785293,42	396315693,57	125326026,415	1,01E+008	1,29E+009
	Total	15	1258632295,61	1480765097,38	382331904,12	1,01E+008	5,26E+009

We observe through the descriptive statistics and through the graphs that there are differences of mean of environmental, social and financial performance among clusters. In other words, Cluster 1 shows environmental, social, and financial average performance higher than Cluster 2 which, in turn, presents environmental, social and financial average performance higher than Cluster 3. Thus, it can be inferred, in view of this result, an association among the variables of environmental, social and financial performance.

Cluster 1, formed only by the Group Louis Dreyfus Commodities, presents higher results in all variables, in other words, it was the group that reported the most environmental and social indicators and which presents the highest net revenue. Cluster 2, formed by six companies, presents average performance at an intermediate level in the three variables and Cluster 3 presents an average performance lower than the other clusters in the three variables. Thereby, it is observed that the higher the environmental and social performance, the higher the average revenue found which may suggest an association among these variables.

This results could be explained for several reasons as size of the groups and companies, access to more complex information systems, higher pressure from its stockholders and stakeholders to disclose results and achieve better social/environmental performance (Norman, & Macdonald, 2004), pressure of local communities to perform environmentally better (Azzone, Bertelè, & Noci,1997), etc. Even if the legal regulations remain practically the same for all the groups, variables with more local relevance could affect the results of this research. It is worth emphasizing that this results work in an exploratory manner, we cannot state about a relationship or causality. And the association may be related to the company's different characteristics, such as its size.

Conclusion

This research had a main objective to identify the sustainability strategies of the Brazilian sugar and ethanol mills industry that participate in the Clean Development Mechanism (CDM) in view of the Triple Bottom Line of Elkington. To achieve this objective we analyze the sustainability reports of several groups of sugar and ethanol mills, developed according to the GRI framework. Being a framework of voluntary disclosure, many companies do not make the disclosure of all indicators or disclose them incompletely. Thereby, it becomes more complex for the performance measurement in sustainability and comparing results.

Concerning the first specific objective, Measure the results of the mill's practices regarding social and environmental dimensions to measure, we identified the main indicators reported with respect to environmental and social dimensions. About the environmental dimension, the most reported indicators by the mills refer to the organizations' initiatives and strategies for environment protection and preservation. On the social dimension, the most reported indicators refer to programs related to human resources management.

As for the second specific objective, to identify the practices undertaken by the mills aiming at environmental preservation and protection, we survey the environmental preservation practices resulting in 25 distinct actions. The most commonly performed practices are related to the reduction of cane burning and CO2 emissions; preservation or restoration of the Permanent Preservation Areas (PPAs) and Private Reserve of the Natural Heritage (PRNH) or seedlings cultivation; and electricity generation. It is noteworthy that the reduction of CO2 emissions are related to the CDM targets.

As regards to the third objective, to identify the relationship between sustainability practices and financial performance of these organizations, we found that in the clusters where companies presented a higher social and environmental performance, in other words, that reported more indicators in these dimensions, it was also observed a higher volume of net sales revenue. This result indicates an association between the socio-environmental performance and the financial performance, considering the research limitations.

This research presents some limitations, as the sample size did not allow for the use of more robust statistical techniques. In addition, the disclosure of incomplete information impairs the measurement and makes the mills performance more difficult to compare. Another limitation is that the groups we survey present different number of mills, which complicates the comparison of the performances in the researched sample. Additionally, the financial performance was verified on different data sources.

This study contributes by presenting a performance analysis in sustainability of mills groups that participate in the Clean Development Mechanism (CDM). Although the participation in the CDM may indicate the companies' concern with sustainability, there is still opportunity for a greater disclosure of the mills sustainability performance. Through the disclosure of more comprehensive reports for a more effective communication with stakeholders and effectively demonstrate the industry's contribution to the sustainable development of their business.

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