

Managers' perceptions about the contributions of the ISO 14001 certification process to environmental accounting practices

Anisio C. Pereira^a; Silvia B. de Melo^b; Vilma G. Slomski^a; Elionor F. J. Weffort^a

^a Fundação Escola de Comércio Álvares Penteado, Centro Universitário Álvares Penteado - FECAP

^b Faculdades Integradas de Fernandópolis

Article Info

Article history

Received: 1 May 2012

Accepted: 1 March 2013

Key words

Environmental accounting practices

ISO 14001 certification

Agroindustry

Sustainability

Social accountability

Abstract

The need to harmonize economic development with environmental protection gave rise to what is usually called development and sustainability. This study is aimed at getting to know managers' perception about the ISO 14001 certification process in environmental management practices in a sugar and alcohol industry in the State of Minas Gerais, Brazil. A descriptive research with a qualitative approach was undertaken. Data were collected through interviews and documentary analysis. The certification process is integrated in the environmental management system and the other fact areas enhance the effectiveness of environmental management practices. The environmental certification process benefits from the implementation of an environmental management system, with a view to improving environmental performance and, consequently, other aspects like company image and the value added to the product. In conclusion, the integrated action of the management team, environmental certification and other areas leads to a better environmental performance, thus contributing to the alignment among management, targets and organizational strategies.

Copyright © 2011 FEA-RP/USP. All rights reserved.

1. INTRODUCTION

The lack of natural resources caused by indiscriminate use, in combination with the disorderly growth of the global population and the intensity of environmental impacts serves as an alert to the impossibility to transform the rules of nature and the importance of reformulating one's environmental practices. In that context, the sustainability paradigm of economic and environmental systems has gained strategic and urgent evidence.

Modern societies' production mode causes irreparable environmental damage through the indiscriminate exploration and degradation of natural resources. The capitalist logic of the best economic performance through increased productivity and enhanced economic and social inequalities has taken the contemporaneous society to an abyss from which there is no way back (Rocha; Siman, 2005).

Through improvements in their products, processes

and services, organizations can neutralize the environmental impacts they cause.

According to Slomski et al. (2010), to produce goods and services, companies need to use resources and strategies that take into account sustainability, treating effluents and waste, which need to be measured and controlled. This concern is noteworthy when considering the number of laws on the theme, the establishment of organizations working to preserve the environment, community concerns, clients in search of ecologically correct products and services etc.

In this context, sustainable development has become necessary and, in accordance with the same logic, the preparation of people with a different profile, professionals with an open view of the company, who add the social and environmental to the economic dimensions and, thus, the rational exploration of natural resources. Environmental management becomes increasingly important, arousing the idea in companies that investments in environmental quality are fundamental to the clients, to the competitiveness and to add value to the product.

To cope with the challenges and requirements of quality, safety, environmental management and social accountability, companies look for norms, standardized rules and certification systems. In this sense, they work to

Corresponding author: : Tel +55 11 3272-2337

E-mail: profanisio@fecap.com.br (A. C. Pereira); sbmeloss@yahoo.com.br (S. B. Melo); vilma.geni@fecap.br (V. G. Slomski); eweffort@gmail.com (E. F. J. Weffort)

FECAP - Av. Liberdade, 532 - Liberdade, 01502-001
São Paulo, SP - Brasil

put in practice an effective system that can be integrated into other management requisites, helping them to achieve their economic and environmental objectives. Brazilian and international certifications can benefit society and grant further competitiveness to organizations.

In view of the need to introduce some kind of standard that is capable of orienting and supporting environmental behavior, in March 1993, the International Organization for Standardization – ISO, through the Technical Environmental Management Committee –TEM (ISO/TC207), published the series called ISO 14000, involving: environmental management system; environmental audits; environmental labeling; environmental performance assessment; product lifecycle assessment etc.

In 1996, the first version of the environmental management standard based on ISO 14001 was published. An environmental management system (EMS) based on the ISO 14001 standards allows an organization to control the impact of its activities and processes on the environment.

To create means for permanent activity control, establish preventive action procedures, minimize risks, avoid problems with infractions, improve operational efficiencies and gain competitive advantages, the series ISO 14000 became used as an environmental management tool to enhance the management and reliability of processes and products. This standard presents management systems and methods, focusing on the processes needed to achieve results.

In combination with the implementation of an environmental management system, the concept of certification emerges to confirm that a company is capable of complying with a range of requisites, described in a normative standard (Cajazeira, 1998). Hence, certification by environmental management standards, particularly ISO 14001 in this research, confirms the organization's environmental competency, besides compliance with the legislation pertinent to the activity.

The expressive multiplication of sugar and alcohol industries in a relatively short period of time gave rise to concerns and the need to study the impacts this sector can provoke. It is well known that the sector gained prestige and aroused the interest of developed countries because of its ethanol production. Despite the economic benefits, however, some environmental aspects need to be improved. Concerns with the environment and the reality of the sugar and alcohol sector motivated the development of this research, which sought answers to the following question:

How do managers perceive the contributions of the ISO 14001 certification process to environmental management practices?

In view of this problem, the following objective was established: To get to know and analyze managers' perception about the ISO 14001 certification process in environmental management practices in a sugar and alcohol industry in the state of Minas Gerais, with a view to identifying the function of environmental certification in the strategic context of management practices and, thus, in the organization's development, value addition

and competitiveness.

Environmental certification is considered a tool that allows organizations to put in practice a permanent management process of its environmental impacts, with the ability to achieve effective results through a better environmental performance. It can also serve as a valuable instrument to consolidate co-responsibility, involving companies and environmental control entities. On the other hand, the certification process motivates employees to change attitudes, reflecting in the development of preventive measures, strengthened by the activities of the TEM.

The researchers expect this study to contribute to more in-depth discussions and a better understanding about the certification process of environmental management standards, highlighting ISO 14001 in this research, which confirms the organization's environmental competency, besides compliance with the legislation pertinent to its activity and services.

2. THEORETICAL FRAMEWORK

2.1. Economic development and sustainability

The sustainable development theme has occupied the agenda in recent times. Much has been written about sustainable development, which are complex and often unclear and diffuse concepts. According to Slomski et al. (2010), one cannot talk about development without sustainability, which is more strongly defended when economists and social scientists start to perceive that economic growth is a necessary but insufficient condition to promote development.

Assuming the above means that economic development presupposes the sustainability of the planet. Oliveira and Santos (2007) highlight the difference between growth and development, which is that growth does not automatically lead to social equality or justice. The accumulation of wealth, which happens in the hands of few individuals in the population, is the only aspect considered, while no other aspects, like the quality of life of the populations, is valid. Sustainable development, in turn, is truly concerned with the production of wealth, but is aimed at its distribution, at a better quality of life for the entire population, therefore taking into account the environmental quality of the planet.

This perception of economic development started to be defended as from the second decade of the 20th century, when the environment was incorporated into economic development theory. As a result of the problems caused by the indiscriminate use of natural resources and of the perception that, if not taken care of, these can compromise the survival of future generations, economic theory once again had to rethink its concepts (Rocha; Siman, 2005).

Thus, the sustainability concept defended here is in accordance with Slomski et al. (2010) and is related to a production chain that does not degrade nature in order to develop, but which develops in view of the sustainability of the planet and the possibility of constant renewal of the nature, with concerns that range from the extraction

of raw material to the final destination of the product or its packing, that is, being economic feasible, socially ethical and fair.

This understanding also follows the definition of sustainability that was widely published by the Brundtland Commission (WCED, 1987), which considers sustainable as the development that does not degrade nature to satisfy the needs of the present generation and, in that sense, does not compromise the needs of future generations. The definition clearly shows one of the basic principles of sustainability, which is the long-term view, as the interests and survival of future generations depend on present actions and initiatives.

The long-term view suggests that sustainability directly influences companies' behavior, which need to be concerned not only with economic, but also with social and environmental issues, which reinforces the understanding that the sustainability of the planet presupposes that companies take into account the impact their activities cause on the environment and create neutralization mechanisms and forms and, thus, a clean production. According to Kotler (2004, p. 545), the challenge is to develop a self-sustainable economy, a fact that represents both a challenge and an opportunity.

In this sense, Savitz (2006, p. 2) considers that sustainability demands economic activities that do not cause damage to the environment and living beings but, on the opposite, strengthens and defends them. Sustainable companies generate profits for their stockholders and, at the same time, protect the environment and improve the life of the people they maintain informed. The natural balance on the planet and guarantees for the preservation of natural resources can only exist for future generations.

New social pressures and demand movements, through the activities of organized groups of professionals, resulted in new laws. These changes intensely affect the social and political environment the company is active in, creating new guidelines and limitations for its effective operation, according to a perspective that considers the maximization of financial returns, with a view to sustainability (Callenbach, 1993; Maimon, 1994).

Applying the principles of sustainable economic development means living within the capacity of existing ecosystems. This demands changes in many aspects of society though, as well as in the way companies manage their business. This understanding is related to how managers conduct their businesses, their beliefs and values (Slomski et al. 2010).

In summary, companies develop, innovate and gain size and economic importance, keeping in mind their whole product lifecycle and environmental sustainability. For this purpose, they will certainly need to reconsider their beliefs and values. That is the thesis defended here, that is, the adoption of an economic development style with sustainability for the nation, in which economic growth can be combined with a healthy and balanced lifestyle, a fact that used to be considered irreconcilable.

2.2. Changes in corporate management and the environmental quality of the production process

The emergence of the economic development and sustainability paradigm also gave rise to greater environmental awareness. The attention focused on cleaner production practices also induces more correct environmental acts, in view of well-known degradations that are widely disseminated by communication means and the media in general.

The global scenario of environmental degradation and democratization, decentralization and economic liberalization process has allowed society to criticize economic development projects that do not include environmental protection measures (Griffith, 1992). Frosini and Carvalho (1995) a management system as a combination of staff, resources and procedures, within any complexity level, whose associated components interact in an organized manner to accomplish a specific task and achieve or maintain a given result.

This gives rise to the need to improve companies' environmental performance which, in a globalized market, tend to apply environmental corporate administration, so that they are acknowledged and use the full potential of benefits offered by the Environmental Management System.

Various definitions of Environmental Management System (EMS) exist but, in this study, the concept of the ISO 14001 (2004) standard is adopted, which define EMS as that "part of the management system of an organization used to develop and put in practice its environmental policy and manage its environmental aspects". Also according to ISO 14001, a management system is "a set of inter-related elements, used to establish a policy and objectives to reach this policy" and which "includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources".

Environmental management emerges as a form of competition, in which the quality of products and services plays an important role in the business strategy. In this sense, it is aimed at putting human activities in practice, so that they can cause as little impact as possible in the environment. This organization ranges from the choice of the best technique to compliance with legislation and the correct allocation of human and financial resources (Oliveira and Santos, 2007).

One important environmental quality certification initiative was the publication of the environmental standard series NBR ISO 14000 in 1996. To standardize the voluntary implementation of Environmental Management Systems (EMS) in different activities, the ISO – International Organization for Standardization – issued a series of standards to provide organizations with the instruments needed to manage the potential environmental impacts of operating a business, considering its activities, products and services.

Thus, the Brazilian companies gained an environmental management support tool. The technical standard of the International Organization for Standardization: ISO 14000 Environmental Management Standards, which established guidelines for organizations that aimed to apply a new environmental management and certification tool to their products, processes and services. Thus, organizations gained support from the

international standard ISO 14000 to put in practice and assess their environmental management systems (JONES, 2008).

The ISO 14000 series is a set of standards related to Environmental Management Systems. It covers six well-defined areas: ISO 14001 Environmental Management Systems, ISO 19011 Environmental Audits, 14024 Environmental Labeling, 14031 Environmental Performance Assessment, 14040 Product Lifecycle Analysis and 14060 Environmental Aspects in Product Standards.

Valle (1995, p. 55) highlights that ISO 14000 “aims for an EMS that helps companies to comply with their environmental responsibilities according to concepts and procedures, without losing regional characteristics and values out of sight”. In that sense, Environmental Standard ABNT NBR ISO 14001 – Environmental Management Systems has been adopted on a large scale, as tools to support productive standards that are more compatible with the new environmental management model.

Initially, the environmental management focus was based on compliance with regulations. In many of these cases, these were complex and overlapped, including federal, state and municipal requirements. The organization should comply with all, despite mutual conflicts. Thus, environmental management was and, in some situations, still is practiced in a reactive and fragmented manner, instead of avoiding the occurrence of problems.

2.2.1. ISO 14001

An EMS model represented in ISO 14001 assumes a PDCA – *Plan-Do-Check-Act* approach, so that all environmental aspects are systematically identified, controlled and monitored, with a view to the continuous improvement of the environmental management system and improvements in the organization’s environmental performance, according to Figure 01.

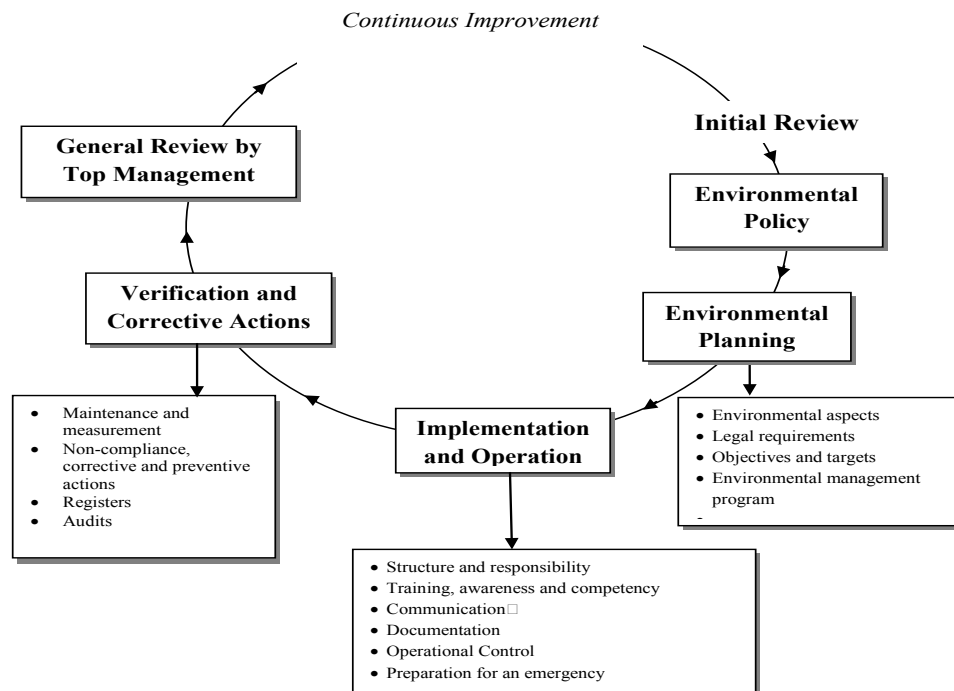


Figure 1 Environmental management system model: PDCA

Source: Adapted from Maimon (1999); Barbieri e Cajazeira (2004); ABNT NBR ISO 14001 (2004)

Considering certification as the public recognition of the environmental management system put in practice, Donaire (1999, p.68) states that the main objective of ISO 14001 is to “attend to the organizations that are part of an effective environmental management system, which can be integrated with the organization’s other objectives”. According to Piva et. al, (2007, p.8) ISO 14001 emerged to create a pattern for the different aspects related to the environmental management systems and methods.

This standard defines the requisites needed to put in practice an EMS, which the company has to comply with to gain the respective certification. According to this

objective, the development course of an efficient EMS is as follows:

- Establishment of an environmental policy;
- Definition of goals and targets;
- Establishment and implementation of a program to comply with the environmental policy and achieve the goals and targets;
- Monitoring and measurement of its efficacy;
- Correction of problems;
- Periodical review of functioning results with a view to a better EMS and environmental performance.

According to Labodová (2004), the sequence to

get ISO 14001 certification basically follows the same system as the ISO 9000 standards. In that sense, ISO 14000 determines that environmental certification can only be based on ISO 14001.

The EMS certification is the instrument the company uses to prove its positive relation with the environment and compliance with the requisites of ISO 14001. This title is conceived through Accredited Certification Organs (ACO). It is highlighted that not all companies with an EMS are certified.

2.3 Studies about the contributions of the adoption of Environmental Management Systems based on ISO 14001

The international literature review shows that many studies are being undertaken to assess the motivations, costs, benefits and difficulties to adopt an environmental management system based on ISO 14001.

As early as in 1996, Diamond investigated the main motivations to develop an EMS. According to that study, the respective response frequencies, indicated between parentheses, are as follows:

- The acquisition and/or maintenance of competitive advantages (7);
- The improvement of environmental performance (6);
- The possible obtainment of ISO 14001 certification (5);
- Compliance with environmental legislation (4);
- The potential changes in the regulatory conjuncture, underlining the possibility of receiving less audits by competent entities and gaining licenses more easily (3).

These same results are present in the study by Cascio (1998), which covers 99 companies and presents the following motivations to obtain ISO 14001 certification as a result: a) Client requirements (22%); b) Competitive advantages (20%); c) Improvement of EMS (18%); d) Others (17%); e) Impact on public relations (9%); f) Influence of governmental relations (8%). According to that researcher, companies mainly put in practice an EMS for reasons related to the internal efficiency of the management system, the reduction of waste and proactive compliance with legislation.

Hillary (1999) investigated the motivation to adopt an EMS in Small and Medium-Sized Companies (SMC) and concluded that it is strongly influenced by clients in comparison with the influence of other stakeholders. In the same sense, in the study by Darnall et al. (2000) the importance of clients to adopt an EMS is equally confirmed. In fact, that author's study reveals that, in general, companies indicate that the factors that influence the decision to adopt an EMS are as follows: a) Satisfaction of client requisites; b) Maintenance of competitive advantages; c) Cost reduction; d) Improvement of relations with the community.

In the study by Delmas (2002), it is evidenced that companies adhere to ISO 14001 when they perceive that this allows them to improve their environmental performance or facilitate their business in certain markets.

The results indicate that companies considered the main incentives to adopt ISO 14001 as important or very important, according to the answers indicated between parentheses, accompanied by the respective percentages:

- Improved management of environmental impacts (72%);
- Public demonstration of environmental commitment (66%);
- Reduced pollution (62%);
- Reduced environmental risk (62%);
- Increased competitive advantages (62%);
- Improved compliance with governmental determinations (55%);
- - Increased market quota (54%);
- Improved compliance with legislation (51%);
- Increased business opportunities in international markets (51%);
- Improved internal communication among managers (47%);
- Access to new markets (43%);
- Opportunity for marketing / propaganda (43%);
- Communication with the community (40%);

In the study by Corbett, Luca and Pan (2003), environmental performance improvements are also underlined, in which the main motivations to get ISO 14001 certification are as follows: improved environmental performance, competitive advantages, client requirements and many other benefits companies aim for when putting in practice an EMS through the standard ISO 14001.

In addition, in the study by Darnall (2003), two important factors are analyzed that influence companies' decision to obtain ISO 14001 certification, which are the regulatory and social institutional pressures they are subject to and the internal competencies they have at their disposal; also, regulatory pressures can take different forms, including, for example, the indication of requisites to attend to the company's needs in the following processes: a) – Obtainment of certain licenses; b) Adoption of specific control technologies; c) Monitoring and information on environmental activities; d) Audits by competent entities; e) Practices to keep in mind in view of legal situations.

The social pressures originate in entities external to the companies. The author concludes that environmental groups, citizens and the media demand appropriate management from the perspective of their environmental strategy.

According to Bettiol (2007, p.55), implementation costs basically involve the hiring of a consulting company to start the creation process of the environmental management system, employee training and the creation of a monitoring system that will guarantee the maintenance of the continuously improving environmental management principle. Process costs naturally vary along with the company's dimension, its complexity and the type of system put in practice.

The company should consider some costs though, whether at the level of system implementation and maintenance (definition of the system, formation, maintenance of the program monitoring, possible additional staff) or at the level of certification and

auditing. These costs are harder to estimate, as they include spending or investments in the improvement or substitution of processes to gain credibility in the ISO 14001 certification.

For many companies, cost acts as a limiting factor in the process when implementing an environmental management process. According to Tachizawa (2008 p. 21), however, when making strategic decisions integrated in the environmental and ecological issue, organizations will achieve significant cost reduction advantages and enhance medium and long-term profits. According to a diagnosis by that same author, companies like 3M, for example, adding up the 270 thousand tons of atmospheric pollutants and 30 thousand tons of river effluents it has stopped launching into the environment since 1975, have been able to save more than US\$ 810 million, thus fighting against pollution in the 60 countries it is active in. Scania Trucks calculates savings of about R\$ 1 million as a result of its environmental management program and cut down on its energy consumption by 8.6 %, water by 13.4 % and waste production by 10% in 1999 only.

Studies by Harrington (2001) reveal the numerous benefits achieved after the certification of an EMS, reinforcing that its advantages surpass the costs required. In general, the benefits include:

a) benefits for the company: market access; compliance management; regulatory incentives; reduction of responsibility and risk; better access to insurance; better access to capital; improved process efficiency, etc.

b) benefits for the client: safe consumption of environmentally correct products or services; monitor the useful life of the product; confidence, contribute to the preservation of natural resources and reduce pollution.

This reveals that, in practice, conquering certification is always a differential and serves an important requisite, especially in internal and foreign trade.

Drawing a parallel with the sugar and alcohol sector focused on in this research, Rodrigues and Ortiz (2006 p.1) mention that “Brazil is known around the globe as a leader in sugar and alcohol production and efficiency”. The international market is concerned with the origin of the alcohol it is to import and imposes restrictions or stimuli that need environmental certification. Hence, to participate in the global market, Brazilian companies need to eliminate restrictions inherent in the product and the production process.

These studies evidence many factors that motivate companies to take interest in environmental certifications. In that sense, the certified environmental management system has gone through an exponential growth movement, as companies see this tool not only as a mere control function of their activities’ environmental impacts, but also as help to improve these procedures, making them more competitive than non-certified procedures.

2.4 The sugar and alcohol sector: characteristics, environmental, social and economic impacts

Sugar cane arrived in Brazil in the year 1500. With the help of fertile soil, a warm and moist tropical climate and African slave labor, it spread rapidly, turning the country into the main global sugar cane producer in the mid-17th century. It is highlighted, however, that the 1929 crisis negatively affected the sugar exportation performance. In the same period, therefore, the Brazilian government adopted measures through incentives like mixing 5% of alcohol into the fuel, and the international oil crisis stimulated a new intensification movement in alcohol production and consumption (Piacente; Piacente, 2009).

Operations in the sugar-alcohol sector initially depart from the agricultural phase, moving on to the industrial phase. In research elaborated by WWF Brazil (2008), it is verified that, based on the land opening procedure for sugar cane crops, intense machinery use provokes impacts that affect the biodiversity, air, water and soil. According to the same author, on the plantations, the impacts derive from pesticide and fertilizer use, water consumption and pollution, air pollution and water changes in biodiversity. Impacts during the harvesting phase result from compacting, loss of soil fertility and air pollution, specifically because of the burns. And finally, in the post-harvesting phase, the impact on soil erosion intensifies.

The most controversial and most frequently discussed impact over the years has been straw burning as a method to facilitate the harvest. According to Wenzel, Haulschild and Alting (2006, p. 52) this procedure entails “contributions to toxicity and acidification” and “are therefore mutually exclusive in principle”. In that sense, Campbell (2005, p. 47) emphasizes that the solution would be “the mechanization of the harvest (to reduce the straw burning), as it grants productivity gains and reduces the severity and number of occupational accidents, besides minimizing the atmospheric pollution”. In the industrial phase, the impacts derive from water consumption; production of bagasse; cake filter; issuing of particles and stillage. The sugar cane washing procedure is one of the production phases that most consumes water, but the use of this natural resource is not just limited to this operation. Its use also involves other important phases of the productive system and is responsible for a considerable amount of waste, in some cases with a considerable organic load.

In this respect, the study by Carmo (2008) has shown a drop in water capitation for the sugar-alcohol sector between 1997 and 2007.

According to Burgi (1985), sugar cane bagasse is considered the main residue of the sugar and alcohol industry. It is estimated that the 558.72 million tons of sugar cane mown in Brazilian sugar and alcohol industries produce about 167.40 million tons of bagasse.

Technological advances in the sugar-alcohol sector have valued bagasse as a source of energy, attending to the mill’s own energy needs and trading the surplus with others.

When the juice is treated, impurities are removed through a flocculation or decantation process, resulting in a solid and sugar-rich material that is called “cake filter”. Depending on the variety and ripeness of the cane, this residue concentrates high levels of calcium, nitrogen

and potassium, which is considered an excellent organic compound. Therefore, it is frequently used nowadays as fertilizer in sugar cane field reformation and plantation areas.

According to Piacente and Piacente, (2009), the practice of using cake filter as a substitute input for agriculture and the nutritional advantages of the product have been known since the 1970's. The authors observe that this side product can cause severe damage to the water mantle and soil when stored and applied inappropriately. Therefore, its rotating use is recommended to avoid increasingly toxic levels of heavy metals in the soil.

Stillage is originally a side product of sugar production. It is eliminated in the crystallization process of the sugar cane juice. Barros (2006, p. 36) highlights that concerns with the environmental impact of disposing of this effluent in water flows is recent, dating back to 1967. The infiltration of stillage into the subterranean water makes it undrinkable, due to high concentrations of ammonium, magnesium, aluminum, iron, manganese, chloride and organic matter. Soils under the stillage draining channels are excessively susceptible to contamination, putting the water tables at risks because of the presence of heavy metals (Hassuda, 1989).

Nowadays, one apparent solution for the rational disposing of stillage is called fertirrigation. Although its use in practice goes back a long time and is widespread, it cannot be excessive or indiscriminate, as its polluting potential compromises the environment (Piacente and Piacente, 2009).

As regards the influence of the sugar and alcohol sector in terms of social impacts, the studies by WWF Brazil (2008) reveal issues involving monoculture; reduction of the population occupied in family agriculture; migratory movement of workers; and gradual reduction of jobs offered in function of mechanical harvesting.

The sugar alcohol industries increased the Brazilian Gross Domestic Product (GDP) and exerted a clear influence on economic aspects, according to Barros, (2006). Other noteworthy factors in that sense are investments in new technology, increased production and equipment; reduction of costs, risks; fines and indemnities; competitiveness in the Brazilian and international markets.

It is inferred that factors like the climate, quality, cost and investments in research by public and private institutions turned the Brazilian sugar and alcohol market into an important attraction, arousing foreign companies' interest in biofuel trade.

When considering environmental preservation, however, this rule is no exception for the sector, as it involves: raw material, chemical products, water, energy, as well as liquid, solid and gaseous waste products. Hence, when not managed correctly, the impacts can become positive or negative.

3. RESEARCH METHOD

As the research objective was to investigate

managers' perception in a sugar-alcohol industry about the ISO 14001 certification process in environmental management practices, a descriptive and qualitative research was considered the most appropriate strategy. The main aim of descriptive research is to describe the characteristics of a given population or phenomenon (Lakatos; Marconi, 2007; Vergara, 2008).

Qualitative research appeared as the most appropriate paradigm, as the survey of beliefs, knowledge and opinions is essentially interpretive. Hence, it would not make sense to seek central generalizable research axes, which would be meaningless here. In addition, qualitative research always contains "an attempt to capture the participants' perspective" (Ludke; André, 1986, p.12).

The study was delimited to a sugar and alcohol industry. This selection was made after consulting the database available on the website of INMETRO. After analyzing the industries, it was verified that, out of 721 industries registered and certified in different segments, only three belonged to the sugar and alcohol sector and possessed a certified environmental management system. After this identification, the company website was studied and, then, a visit was made and some managers were contacted to understand the type of management that existed and check whether the research could be undertaken with the existing management group, as the success of any quality improvement proposal in the implementation of an EMS or PDCA depends on the acceptance of the managers and other stakeholders in this method.

In that sense, the company was chosen in function of its type of environmental management, the availability of the management group to participate in the research and the possible contributions it could imprint in this research, given the importance and complexity of the EMS.

The population consists of 13 managers linked with the EMS. In this universe, three managers were directly linked to the environmental management program and three belonged to different areas, as shown in figure 01 below. Nevertheless, all of them were involved in the maintenance of the program and took part in the research. The interviewed managers were chosen, in view of their availability to participate in an interview. In this study, a census was chosen, considering the fact that all managers were interested in the research and constituted a representative quantity for the interviews. According to Rey (1999), in a qualitative study, the scientific knowledge does not gain legitimacy through the number of subjects studied, but through the quality of the ideas and thoughts produced.

The data were collected through interviews and documentary analysis. Interviews are one way to obtain information on a given theme, by means of a professional conversation with another person, and permits verifying facts, opinions, feelings, action plans and the subjects' conduct (Marconi E Lakatos, 2008). For the interview, a semi-structured script was organized, consisting of open questions, structured as follows: 1st part – 05 questions to get to know the company profile; 2nd part – 05 questions to identify the interviewees' sociodemographic data; 3rd part – 26 questions. The questions about the third part of

the interview script were subdivided in five categories:

- 1st category – The managers' perception about the ISO 14001 certification process;
- 2nd category – Environmental impacts;
- 3rd category – Social impacts;
- 4th category – Economic impacts and
- 5th category – The result of the ISO 14001

certification.

Alphanumerical codes were attributed to each of the interviewees for the sake of preserving their identity. In the alphanumerical codes, the letters had the following meanings: RM1, responsible manager. They are followed by number to indicate the order of the interview, as shown in Table 1 below.

Table 1. Identification of interviewed subjects' codes

Interviewee	Function	Code
Responsible Manager	Environmental manager	RM 1
Responsible Manager	General Manager	RM 2
Responsible Manager	Integrated Systems Analyst	RM 3
Responsible Manager	Chemical Manager	RM 4
Responsible Manager	Commercial Manager	RM 5
Responsible Manager	Logistic Manager	RM 6
Responsible Manager	Industrial Manager	RM 7
Responsible Manager	Informatics Manager	RM 8
Responsible Manager	Agricultural Manager	RM 9
Responsible Manager	Financial Manager	RM 10
Responsible Manager	Human Resource Manager	RM 11
Responsible Manager	Mechanical Manager	RM 12
Responsible Manager	Quality Control Manager	RM 13

The interviews were applied after signing the informed consent term. According to Witter (1990, p. 22), documentary analysis is “that analysis whose objectives or hypotheses can be verified through the analysis of bibliographic or non-bibliographic documents, demanding a compatible method (data collection, organization, analysis). Thus, documents were consulted about the history of the industry under analysis, the management manual, the environmental policy, pictures, reports and training leaflets.

As regards the data analysis methods and techniques, these were submitted to discourse analyses as, according to Carrieri, Silva and Souza-Ricardo (2005, p. 2), “the approach discussed here is part of qualitative analysis techniques and permits an in-depth understanding of the social reality, manifested through the discursive formation by means of individual statements”. Contributing to this reasoning, Lane (1985, p. 08) describes that the proposal of discourse analysis is to graphically structure the central thoughts through repeated words (or synonyms), but following the flow of discourse, using a numerical sequence for each unit of meaning, subject or predicate. The author also considers that this analysis mode represents a tool that facilitates graphical visualization, so as to survey the central thoughts and the sequence of themes and words, which are indicated with numbered arrows, according to the sequence.

Thus, with the entire empirical reference framework at hand, after consulting the documents and transcribing the semi-structured interviews, a continuous analysis and interpretation process was developed, in the attempt to establish relations and identify categories, trends and patterns, unveiling their meaning. The data were presented according to the interview script and subdivided in five categories. 1st category – The managers' perception about the ISO 14001 certification process – with five questions; 2nd category – The environmental impacts – with eight questions; 3rd category – The social impacts – with four questions; 4th category – The economic impacts – with four questions; 5th category – The result of the ISO 14001 certification – with five questions.

Thus, in this research, after an initial analysis of the collected data, themes and relations were identified, interpretations were built and new questions were raised. Finally, the descriptive categories were defined.

4. RESULTS AND DISCUSSIONS

The data will be presented based on the interview script and other material collected, as described above, and interpreted and organized according to the following topics. The themes addressed aim to evidence how certification contributed to the environmental management practices.

4.1. A profile of the company and the research collaborators

The research was developed in a company from the sugar and alcohol sector in Western Minas Gerais. The organization selected for the study was denominated **SUCROALA** here, a fictitious name attributed to preserve its identity. The letter A was included because it is the first branch of the group. It was purchased by a group from the state of Pernambuco in 1994 and is a family-owned, closed Brazilian company. In the 1008 harvest, 3.24 million tons of sugar cane were mown, which produced 112 million liters of alcohol and 5.5 million 50-kg bags of sugar. The organization offers more than 3,000 direct and indirect jobs, including collaborators and suppliers and, in 2009, its sales amounted to approximately R\$ 300 million.

ISO 14001 certification was obtained on November 29th 2006 through the company Bureau Veritas Quality International (BVQI). According to the responsible for the EMS, this title recognizes the intense teamwork across all company areas (agricultural, industrial, administrative and logistic).

The research participants were 13 managers, distributed among the following areas: environmental, general, integrated systems analysts, chemical, commercial, logistic, industrial, informatics, agricultural, financial, human resources, mechanic and quality control. Concerning gender, 11 managers are male, representing 85%, against two female ones (15%). Graph 2 illustrates this situation better. In terms of age range, the interviewees were divided in four groups (18-24; 25-49; 50-70 and over 70). Ages ranged between 18 and 50 years. Sixty-one percent of the interviewees are between 25 and 49 years old, meaning that the majority is in the economically and professionally active age range.

What the interviewees' instruction level is concerned, 69% hold a higher education degree, 23% secondary education and only 8% primary education, referring to only one manager. The instruction level does not interfere in data collection on the interviewees' perception though, as the manager with the lowest education level was able to answer the questions clear and objectively, and was highlighted in the industry as the main analysis of the environmental management system.

As regards the functions, 77% of the interviews work as managers, while 23% serve as analysts. The managers' perception is not related to their function though. Considering their time on the job, it is highlighted that 46% of the interviewees had worked in the industry for more than four years, and that none of them possessed less than one year of experience.

4.2. Managers' perception about the ISO 14001 certification process

As mentioned in the text by Piva et. al, (2007, p.8), ISO 14001 adopts the PDCA as an EMS model. Based on this premise, the first step was to observe the managers' knowledge of and involvement in this method.

The managers demonstrated knowledge about the motives that made the industry apply for environmental certification, which was to gain further economic benefits, improve environmental quality, under the influence of quality and environmental management systems previously implanted in the group's headquarters, which revealed greater control and facility in the processes; and to obtain further access to the market, increasing its sales in Brazil and abroad. The unit under analysis held three certificates at the time of the research: ISO 9001, ISO 14000 and AS 18000, and had already renewed these titles. This demonstrates the industry's commitment to and interest in the environmental issue and its intent to keep up the existing system. The managers' discourse is in accordance with different results found in the studies cited in this research (Diamond, 1996; Cascio, 1998; Darnall et al.; Delma, 2002), which means that they verified improved environmental performance, competitive advantages, client requirements and many other benefits companies aim for when putting in practice the EMS based on ISO 14001.

It was also identified that the managers are familiar with the environmental policy and its dissemination, as well as with its objectives, goals and the organization's actions to sensitize and raise the awareness of collaborators, suppliers and the community. For example, the statement below confirms one of the ways to disseminate the environmental policy in the company.

"[...] the policy, it is disseminated here at the entry, you must have seen it, there's a big panel" RM6.



Figure 2 Integrated system policy on the plant of SUCROL-A

Source: Industry SUCROL - A (2009).

According to the managers, the collaborators and suppliers receive constant training about the procedures of the ISO 14001 guidelines and how to comply, and also receive orientations through information on panels and folders to follow the environmental management

process. On specific weekdays, environmental education teams receive visitors from schools and communities to get to know the industry and its environmental projects.

When asked about their knowledge on the objectives, goals and human, material and financial resource planning, three central thoughts were identified: reduced

use of natural resources, minimization of waste, effluents and particles and budgetary preview. The organization's first objective was to reduce the consumption of water and energy and impact on the soil. The second objective was to minimize the quantity of effluents, waste and particles. On the third axis, the interviewees presented human, financial and material resource needs to reach the objectives (Griffith, 1992). When Frosini and Carvalho (1995) specify that a management system represents a combination of staff, resources and procedures in search of results, the industry should pay attention to the allocation of human, financial and material resources. This was clear in the managers' discourse as, to gain the environmental certification ISO 14001, restructuring was needed, involving new technologies, with equipment to reduce particles, gases and water reuse; raw material quality control; new software; controls; investments in training and information to collaborators and suppliers. According to the managers, the company was active in all sectors, created circumstances and integrated all subsystems to comply with the guidelines of the international environmental standard, perceived as an arduous task but with visible returns.

The analysis of the managers' discourse revealed that gaining ISO 14001 is not easy, as achieving the expected results in the environmental management system demands great changes in the organization. Thus, the interviewees observed that, when undertaking environmental protection values, first, an organization will perceive significant changes in its sector leaders' ways of thinking and acting. The collaborators' routines and tasks will also change to adapt to new equipment and organizational procedures, which provoked behavioral changes, mainly when the system was first implemented.

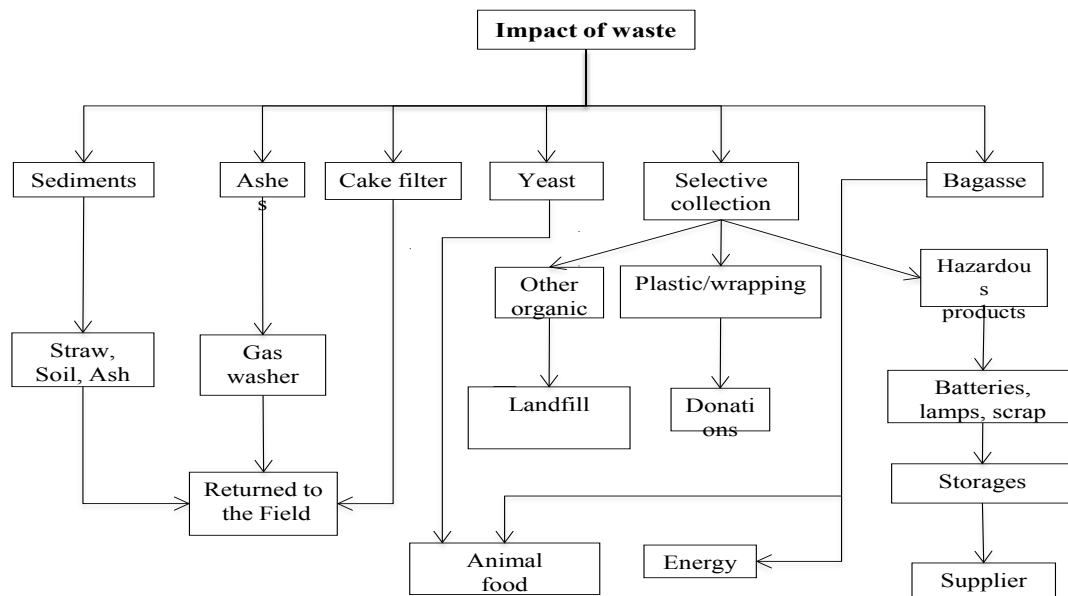
The managers argued that the environmental management system needs constant maintenance, and therefore consider internal and external audits as essential. According to them, these tools help to control and monitor waste and identify training needs, contributing to the improvement process. They also affirmed that the audits show things that are not perceived in the process, sometimes small errors but which, when left undiagnosed, can result in severe non-compliance. This means that, if the method applied to manage the system does not function correctly, it needs change and, if errors continue, permanent change is needed until the PDCA cycle is concluded.

The managers unanimously mentioned a great concern with program maintenance, which is why they meet with the directors on a weekly base, always aiming to discuss what happens, what is going wrong, what can be changed or improved in the system until reaching the intended performance. They underlined that everything is that complex and fast that one careless event is enough to lose the EMS and the entire work with it.

4.3. Managers' perception about the environmental impacts

As regards the environmental impacts, the interviews with the managers revealed that the inclusion of procedures based on ISO 14001 requisites led to the minimization of these impacts the sector provokes.

Next, Graph 1 reveals the information collected about the impact of waste and the actions taken for the sake of mitigation.



Graph 1. Environmental impact:- waste

The managers indicated that the large amount of waste produced in the process practically refers to side products. The straw, soil and ashes resulting from the sugar cane burning and from the burning of the bagasse in the boiler form sediments. All of this is forwarded

to the tanks where the water is segregated, leaving the solid part that returns to the field in the form of fertilizer. The cake filter contains impurities that remain when treating the juice. After analyzing its composition, it is transported to the field, where the agricultural managers

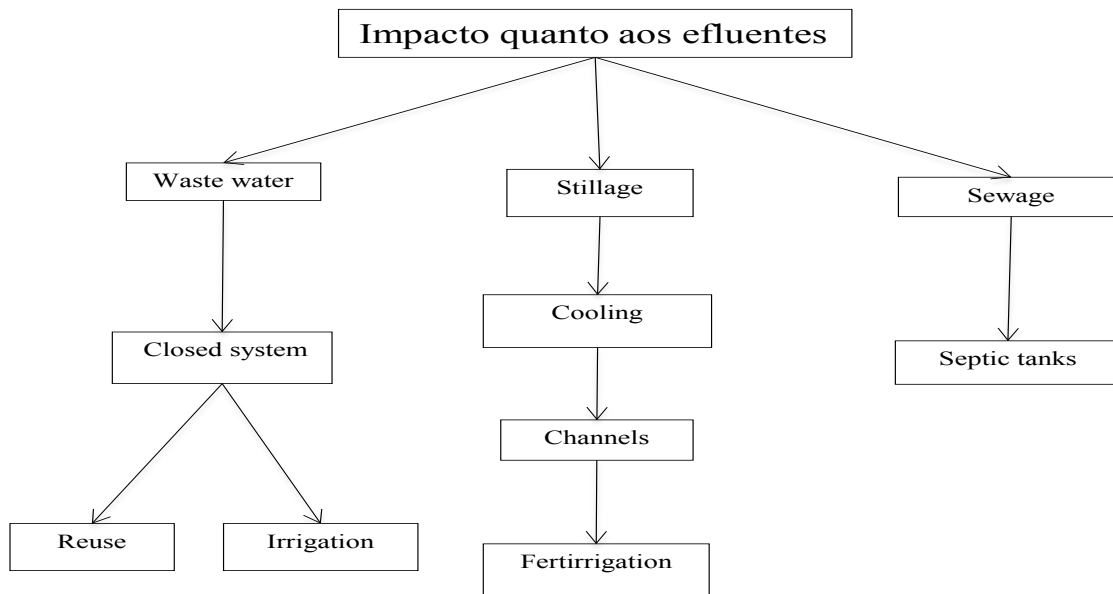
define what amount is to be used as fertilizer. This reduces the purchase of fertilizers and allows the industry to save money. Another residual is the yeast. It is used to promote the fermentation of the alcohol. This material, when no longer useful, goes through filtering and drying, composing blocks that are sold as animal food.

Large quantities of bagasse are produced and, nowadays, these are used to produce energy for the boilers and for external trade. Some years ago, the sole purpose of this resource was to supply the boilers during the harvesting period. Energy rationing brought about a demand. Thus, the bagasse started being used not only for self-supplies, but also to attend to external needs, and this generated a new market. Today, as the managers reveal, the industry projects energy production outside

harvesting periods, thus enhancing its productivity and for a longer period.

At the unit under analysis, the managers declare that, when stored, rains or winds can take away the bagasse, but that this is minimized through mechanical compacting, transforming the bagasse into a kind of chipboard. The wind cannot be controlled 100%, but is largely reduced. According to the managers, this residue is also used as a source of supplementation for animal food, but this happens after the hydrolyzing process called (breaking of molecules to avoid that they produce gases inside the animals' organism).

Regarding the effluents, Graph 2 displays three relevant aspects: wastewater, stillage and sewage.



Graph 2. Environmental impacts: effluents

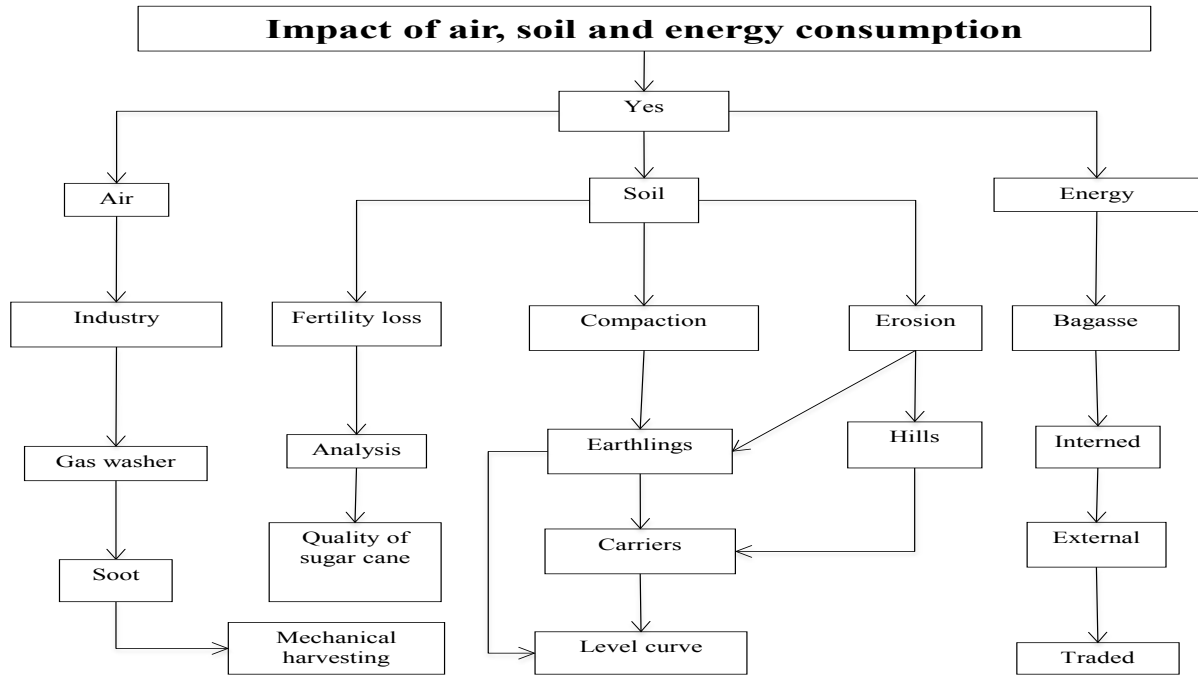
The first refers to the industry's investments in technological and human resources, modifying the treatment system of residual waters by installing the closed-circuit system. In this system, the water recirculates (reuse) and, when no longer used, it is transported to the field in the form of irrigation. This shows the company's concern through the execution of procedures to reduce the consumption and, consequently, the contamination of this effluent, through monitoring and technological equipment. Another aspect is the stillage, which was long considered the main environmental villain and the sector's main liquid residue (Hassuda, 1989; Ludovice, 1996). The implantation of environmental management entailed specific care, including: analysis of calcium and potassium concentration, cooling; construction of channels to isolate the product from the soil and control of the amount to be spread for the sake of fertirrigation. In the third aspect, sewage treatment in the form of septic tanks was highlighted.

Then, it was perceived that the management practices influenced the installation of equipment to monitor and control energy consumption, analyze the quality of the raw material and atmospheric pollution, with gas washers that are fundamental to eliminate the emission

of particles.

Special care was taken with regard to soil management and control, by the mill as well as its lessees, which is considered the main quality factor of the raw material. Hence, the product in the mill reflects this care, as observed in Graph 3.

The managers revealed greater consumption control and monitoring of agricultural inputs, fuels, lubricant oils, storage of parts, scrap and others, although no reduction was found in function of the growth in the planted area and industrial production. Based on this analysis, it is inferred that, if due care were not taken, environmental problems would be even bigger. As regards biodiversity, in accordance with the research by WWF Brazil, 2008, the impacts could range from the preparation of the land to the harvest, and one main point of concern is how sugar cane is advancing on preserved areas. In that sense, the managers affirm that most of the land sugar cane plantations occupy today was previously used for other crops, and mainly pasture. This, in turn, already infringed on environmental laws. Therefore, to avoid future problems, based on pertinent laws, the industry attempts to recompose degraded areas, when applicable, and to preserve existing ones.



Graph 3. Environmental impacts: natural resources

4.4. Managers' perception about social impacts

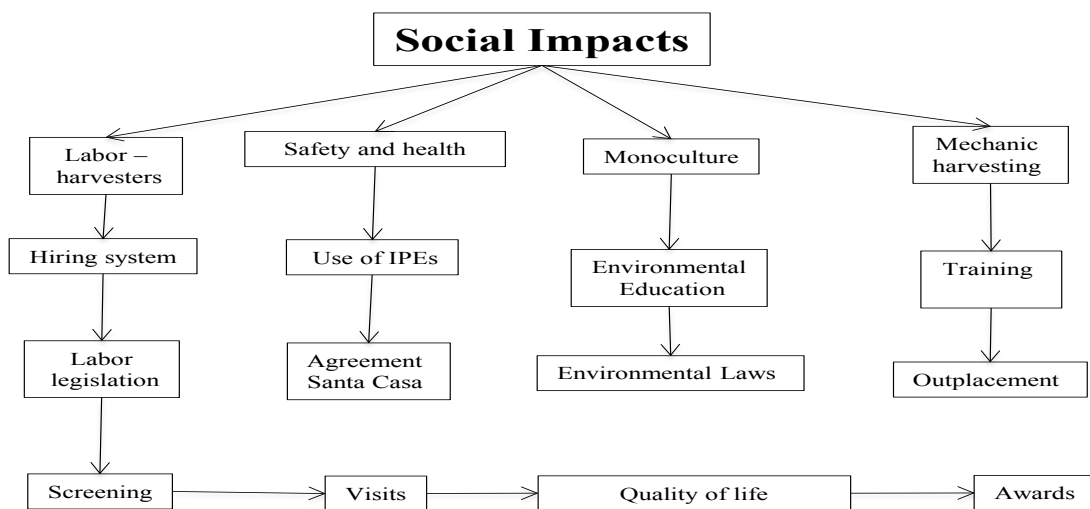
Concerning the social impacts, the managers draw a picture marked by great changes, such as: the replacement of seasonal workers by local or neighboring workforce, which greatly helped to eliminate the migratory movement; accommodations and low life expectancy.

As regards safety and health, it was verified that the industry closed a partnership with the Santa Casa, a hospital in a neighboring city, with full infrastructure and qualified staff (the hospital had idle capacity and was lacking care public) to deliver care to its collaborators.

What the monoculture is concerned, the industry undertakes activities to raise small farmers' awareness

about the need to continue other agricultural activities. The managers affirm that they create expectations about the sugar cane crop and neither develop nor diversify their crops. About the mechanical harvesting process, they reported that society and the workers benefit through a better quality of life as the burns are eliminated and, on the other hand, conclude that the redundancy of seasonal workers is unavoidable. What the company does to mitigate this process is to contribute to these people's education, through courses and training, allowing them to migrate to other work areas.

Next, Graph 4 is included to identify the social impacts that took place.



Graph 4. Social Impacts

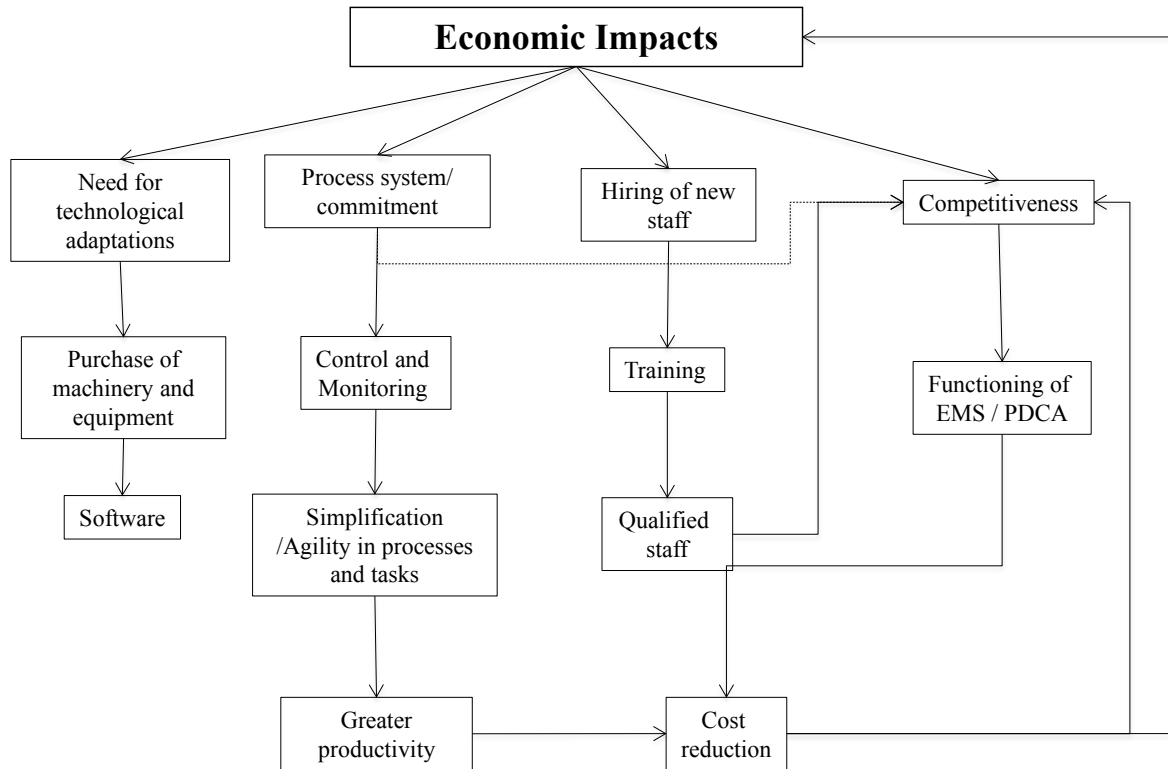
4.5 .Managers' perception of economic impacts

Concerning the economic impacts, the managers revealed that plenty of financial resources were needed as, to the extent that the requisites of the ISO 14001 standard were implemented, it was discovered that equipment, qualified staff, software and other requisites were lacking.

They argued that, despite some errors in the EMS, the advantages it has already provided can be noted, mainly regarding the minimization of effluent and waste management costs, minimization of time (regarding operational and administrative activities, compliance with surveillance, preparation of documents to obtain licenses or renew environmental licenses), greater productivity and greater market credibility, expanding sales contracts.

It was verified that the implementation of the environmental management system and its certification promoted the control and monitoring of activities and processes in the industry, furthered safety, enhanced the collaborators' trust, especially at times of surveillance and environmental license renewals. According to the managers, an industrial unit that takes specific environmental management actions is subject to less pressure from governmental entities and society than units without this management. On the opposite, they believe that the implementation of an EMS and its certification facilitate regulatory aspects; minimize environmental risks and accidents, make productivity more agile, reduce waste, improve revenues; lead to an excellent acceptance of the company's image in the market and to the opening of new markets.

Graph 4 evidences some aspects revealed in the interview with the managers.



Graph 5. Economic impacts

The analysis of the managers' discourse showed a reduction in processes and reports, as they affirm that the environmental management system grants a more macro perspective on the entire process, which improves and speeds up the work, automatically reducing time and costs. As from the moment when the accomplishment of tasks is systemized, people start to note flaws and apply procedures and verifications.

As one manager said: “[...] everyone’s involvement makes the PDCA spin” (RM1). Thus, in accordance with the research by Klocke et al. (1996), factors like commitment and responsibility exert economic

influence in the industry. That is, when an environmental management system is implemented and its objectives need to be achieved, the industry minimizes time spent on staff, the risk of fines and lawsuits due to environmental accidents and new investments, driving an economic chain.

5. FINAL CONSIDERATIONS

This research was aimed at discovering and

analyzing how managers perceive the contributions of the ISO 14001 certification process to environmental management practices in a sugar and alcohol industry in the state of Minas Gerais. As verified, one of the reasons for the adoption of environmental certification and the implementation of the environmental policy in the company was the existence of resources, whether to purchase materials, hire professionals, consultants, make investments or buy new equipment.

As verified, the ISO 14001 certification process contributed to the company through the improvement of its environmental performance, including the treatment of effluents and measures that neutralize the environmental impacts of the productive process, as follows:

i) the effluents and solid residues, such as stillage, cake filter, ashes, sediments and yeast were used as side products, sometimes as animal food supplements, fertilizer or irrigation, or as energy in the specific case of sugar cane bagasse. It is important to highlight that the industry produces all energy needed for its operating activities and, in addition, trades the surplus;

ii) The installation of equipment to monitor and control energy consumption, analyze the quality of raw material and atmospheric pollution, with fundamental gas washers to eliminate the emission of particles (substances produced in the burning of bagasse to produce energy for the boilers and trade);

iii) Special care was taken with soil management and control, by the industry as well as its lessees, as they consider it the primary quality factor of raw material and the factory's product results reflect this care. The managers revealed greater consumption control and monitoring of agricultural inputs, fuels, lubricant oils, storage of parts, scrap and others, although no reduction was found in function of the increase in the planted area and industrial production.

Other benefits the implementation of the EMS entailed included the improvement of the company image, client satisfaction and compliance with legal requisites. Concerning the social impacts, the managers mentioned great changes: a) replacement of seasonal workers by local or neighboring workers, which greatly helped to eliminate the migratory movement, accommodations and low life expectancy; b) As regards safety and health, the industry closed a partnership with the hospital in a neighboring city, which offers complete infrastructure and qualified staff (the hospital had idle capacity and was lacking a care public) to deliver care to its collaborators.

The participating managers demonstrated they were in tune with information and procedures in the ISO 14001 certification process, revealing their positive perceptions about the EMS. Thus, one may say that ISO 14001 can serve as an effective instrument to improve environmental management in organizations. One cannot ignore, however, that obstacles exist which hamper and/or limit the adoption of environmental management systems. In that sense, some recommendations can

facilitate the certification process, including:

a) the elaboration of a guide to support the integration of management systems and the continuous improvement of environmental management systems;

b) the organization of a database on environmental performance indicators that permit environmental performance benchmarking among industrial sectors and individual companies, so as to explore the wealth of information certifying entities possess as a result of the experience in terms of the management of environmental certification processes.

Certifying entities and the competent public authorities can undertake this set of measures and/or recommendations to facilitate this process.

As a limitation, the fact is highlighted that the choice of the method does not permit further generalizations of the findings.

In function of the complexity and range of the topic, as well as the acceptance and availability of informants, a case study would be possible, which would permit more in-depth elaboration of the study, through the use of other techniques and data collection instruments. These could be triangulated to obtain clear evidence on common and particular elements in this context.

This would probably show facts and explain situations in view of the nature and history of the case and the context it is inserted in. For the sake of future research, the following is recommended:

- A naturalistic case study that looks at the context in further depth, looks for the characteristics of the research problem that are considered fundamental and provides a comprehensive and profound picture of the reality studied. The use of a range of information sources permits naturalistic generalizations and the revelation of different viewpoints on the research problem;
- Investigating how audits are performed in organizations that apply for certification, including internal and external audits;
- After the certification and/or recertification period, analyze the reasons that significantly motivate organizations to maintain voluntary certification of the respective EMS, when they can improve their environmental performance solely by maintaining their EMS, without the possibility of certification;
- Determining the existing relation between gaining ISO 14001 certification and the increased market value of companies with environmental certification.

REFERENCES

Associação Brasileira De Normas Técnicas. ISO 14001: *sistema de gestão ambiental*. Recuperado em em: 03 mar. 2012, de <<http://abnt.org.br>>.

- Barbieri J. C. & Cajazeira, J. E. R. (2004). *A nova norma ISO 14001: atendendo à demanda de partes interessadas*. São Paulo: Fundação Getúlio Vargas, cdlib.org/cgi/viewcontent.cgi?article=1009&context=uciaspubs/edite dvolumes.
- Barros, L. G. P.(2006). *Uso e racionalização dos recursos hídricos*. Recuperado em: 07 ago. 2008, de <<http://www.evata.com.br/aguasresiduarias-aula1.pdf>>..
- Burgi, R. (1985). *Produção de bagaço de cana de açúcar auto-hidrolisado e avaliação do seu valor nutritivo para ruminantes*. Dissertação (Mestrado) – Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba.
- Bettiol,V.R. (2007). *Benefícios da certificação ISO 14001* (p.55). Recuperado em 04 de mar. de 2012, de <http://hermes.ucs.br/ccet/deme/emsoares/inipes/iso/>.
- Cajazeira, J.E. R. (1998). *ISO 14001: manual de implantação*. Rio de Janeiro: Qualitymark,
- Callenbach, E. et al. (1993). *Gerenciamento ecológico: eco-management: guia do Instituto Elmwood de auditoria ecológica e negócios sustentáveis*. São Paulo: Cultrix.
- Campbell, H. (2005). *Estudo de caso: a indústria sucroalcooleira no Estado de São Paulo*. São Paulo. UNIETHOS.
- Carmo, B. V. (2008). *Uso da água na produção de etanol de cana-de-açúcar: fase industrial*. Recuperado em 14 jan. 2009, de <<http://www.apta.sp.gov.br/cana/anexos/>>.
- Carrieri, A. P., Silva, A. R. L. & Souza-Ricardo, P. A. G. (2005). *Os discursos ambientais nas organizações: o caso de uma empresa de telefonia*. Anais do XXIX Encontro Nacional da Associação Nacional De Pós-Graduação e Pesquisa em Administração. Brasília, 2005. Brasília: ANPAD.
- Cascio, J. (1998). *The ISO 14000 Handbook*. ASQ Quality Press.
- Corbett, C. J., Luca, A. M. & E Pan, J. (2003). *Global Perspectives on Global Standards: a 15-Economy Survey of ISO 9000 and ISO 14000*. In: ISO Management Systems, Janeiro- Fevereiro.
- Darnall, N., Gallagher, D. R., Andrews, R. N. L. & Amaral, D. (2000). *Environmental Management Systems: Opportunities for Improved Environmental and Business Strategy* In: Environmental Quality Management 9 (3), 1-9.
- Delmas, M. (Vol. 1). (2002). *Environmental Management Standards and Globalization*. UCLAS, - Dynamics of Regulatory Change: How Globalization Affects National Regulatory Policies, Art. 6. Recuperado em: 04 de mar. De 2012, de <http://repositories>.
- Diamond, C. P. (1996). *Environmental Management System Demonstration Project: Final Report*. NSF International, Ann Arbor, Michigan. Recuperado em: 04-03-2012, de <<http://www.p2pays.org/ref/01/00326.pdf>>
- Donaire, D. (1999). *Gestão ambiental na empresa*. 2. ed. São Paulo: Atlas.
- Frosini, L. H. & Carvalho, A. B. M. de (1995), *Segurança e Saúde na Qualidade e no Meio Ambiente*, in: CQ Qualidade, São Paulo, Brasil. (38), 40-45
- Griffith, J.J. (1992). *Gerenciamento da produção agrícola e seu impacto ambiental*. Anais Conferência Internacional Sobre Agricultura E Meio Ambiente, Viçosa. Viçosa: UFV. 75-92
- Harrington, H. J. (2001). *A implementação da ISO 14000: como atualizar o sistema de gestão ambiental com eficácia*. São Paulo: Atlas.
- Hassuda, S. (1989). *Impactos da infiltração da vinhaça de cana no Aquífero Bauru*. Dissertação (Mestrado)- Instituto de Geociência, Universidade de São Paulo, São Paulo.
- Hillary, R. (1999). *Evaluation of Study Reports on the Barriers, Opportunities and Drivers for SME's in the Adoption of Environmental Management Systems* - Comunicação apresentada ao Department of Trade and Industry, Environmental Directorate. Recuperado em: 04 de mar. 2012, de <<http://www.inem.org/htdocs/iso/hillary.html>>
- Inmetro (2008). *Empresas certificadas ISO 14001*. Recuperado em: 20 jul.2008, de <http://www.inmetro.gov.br/gestao14001/>>.
- Jones, D. G. (2008). *Auditoria ambiental*. São Paulo: CRQ VI Região; PROENCO.
- Kotler. P. (2004). *Princípios de marketing*. São Paulo: Pearson Prentice Hall.
- Labodová, A. (N. 12). (2004). *Implementing integrated management systems using a risk analysis based approach*. *Journal of Cleaner Production*. Amsterdam. 571-580.
- Lakatos, E. M. & Marconi, M. A. (2007). *Fundamentos de metodologia científica*. 6. ed. São Paulo: Atlas.
- Lane, S. T. M. (1985). *A linguagem e as representações sociais*. Anais Congresso Interamericano De Psicologia. Simpósio Sobre Representação Social. Caracas. Caracas.
- Lüdke, M. & André, M. E. D. A (1986). *Pesquisa em educação: abordagens qualitativas*. São Paulo: EPU.
- Maimon,D. (1999). *ISO 14000 - Passo a Passo a da Implementação nas Pequenas e Médias Empresas*. Rio de Janeiro: QualityMark.

- _____. (1994, julho./agosto) *Eco-estratégia nas empresas brasileiras: realidade ou Discurso?* Revista de Administração de Empresas da Fundação Getúlio Vargas, São Paulo, 34(4).
- NBR ISO 14001. (2004). *Sistemas de gestão ambiental - especificação e diretrizes para uso*. Recuperado em: 04 de março de 2012, de <http://www.smsengenharia.com.br/Artigos/ISO%2014001%20USO%20EM%20TREINAMENTO.pdf>>
- Oliveira, R. C. & Dos Santos, J. B. (2007). *Gestão ambiental nas empresas do setor de petróleo e gás em Mossoró*. In: Revista Holos, 23. 03
- Piacente, E.A. & Piacente, F.J. *Desenvolvimento sustentável na agroindústria canavieira: uma discussão sobre resíduos*. UNICAMP. Recuperado em: junho 2009, de <http://www.cori.unicamp.br/IAU/meio4.htm>
- Piva, C. D. et. al (2007, setembro/dezembro). *Sistema de Gestão Ambiental implementado aos moldes da ISO 14001:2004 em um frigorífico de abate de aves, no Município de Sidrolândia – Mato Grosso do Sul*. G e DR. 3(3).
- Rey, F.L.G.(1999). *La investigación cualitativa em psicologia: rumbos y desafios*. São Paulo: Ed.
- Rocha, J. M.& Siman, R. F. *Desenvolvimento sustentável: desmistificando um axioma – a sustentabilidade na agricultura em questão*. In: X Encontro Nacional de Economia Política, Campinas, SP, 2005. Recuperado em: 07-02-2012, de <http://www.sep.org.br/artigo/10_congresso_old/xcongresso53.pdf> .
- Rodrigues, D. & Ortiz, L. (2006, outubro). *Em direção à sustentabilidade da produção de etanol*. Recuperado em: 01. ago. 2008, de http://www.natbrasil.org.br/Docs/biocombustiveis/sustentabilidade_eta_nol_port.pdf>..
- Savitz, A. W. (2007). *A empresa sustentável. O verdadeiro sucesso é o lucro com responsabilidade social e ambiental*. Rio de Janeiro: Atlas.
- Slomski, V. et al. (2006). *Gestão de Custos: Uma proposta de internalização de custos da destinação final relacionadas ao descarte do produto e/ou de sua embalagem aos custos de produção*. Congresso USP.
- Tachizawa, T. (2008). *Gestão ambiental e responsabilidade social corporativa: estratégias de negócios focadas na realidade brasileira*. 5. São Paulo: Atlas.
- Valle, C. E. (1995). *Como se preparar para as normas ISO 14000: qualidade ambiental*. Pioneira: São Paulo.
- Vergara, S. C. (2008). *Métodos de pesquisa em administração*. 3. ed. São Paulo: Atlas.
- WWF Brasil. (2008). *Análise da expansão do complexo agroindustrial canavieiro no Brasil*. Brasília.
- WCED. (1991). *Our common future*. Oxford: Oxford University Press.
- Wenzel, H, Hauschild, M. & Alting, L. (2006). *Environmental assessment of products*. Boston: Kluwer Academic Publisehirs. 1-2.
- Witter, G. P. (1990, janeiro./junho) *Pesquisa bibliográfica, pesquisa documental e busca de informação*. *Estudos de Psicologia*. Campinas. 7(1), 5-30.