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ENVIRONMENTAL INFORMATION DISCLOSURE: A STUDY OF AGRIBUSINESS COMPANIES IN BRAZIL

EVIDENCIAÇÃO DAS INFORMAÇÕES AMBIENTAIS: UM ESTUDO COM EMPRESAS DO AGRONEGÓCIO NO BRASIL

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Abstract

The objective of this screening survey was to identify the factors that influence the environmental disclosure of agribusiness companies listed in the Corporate Sustainability Index (CSI) of Brasil, Bolsa, and Balcão (B3) in the Brazilian Stock Exchange. We used the quantitative desk research method, which is classified as exploratory descriptive and performed through documentary analysis. The environmental evidence index was considered a variable of interest, and for the dependent variables, three hypotheses were tested regarding company size, profitability, and indebtedness to determine if there was any significance. The main findings showed that only company size had a positive significance, while the hypotheses on profitability and indebtedness were not confirmed, thus corroborating previous studies raised for the basis of the research. The study also emphasises that being a part of the CSI does not necessarily imply that companies demonstrate a greater level of environmental information disclosure.

Keywords: agribusiness; disclosure voluntary; sustainability index.

Resumo

O objetivo desta pesquisa de triagem foi identificar os fatores que influenciam a divulgação ambiental das empresas do agronegócio listadas no Índice de Sustentabilidade Empresarial (CSI) do Brasil, Bolsa e Balcão (B3) na Bolsa de Valores brasileira. Utilizou-se o método quantitativo de pesquisa documental, que é classificado como exploratório descritivo e realizado por meio de análise documental. O índice de evidência ambiental foi considerado uma variável de interesse e, para as variáveis dependentes, foram testadas três hipóteses quanto ao tamanho da empresa, rentabilidade e endividamento para determinar se havia significância. Os principais achados mostraram que apenas o

tamanho da empresa teve significância positiva, enquanto as hipóteses sobre rentabilidade e endividamento não foram confirmadas, corroborando estudos anteriores levantados para a base da pesquisa. O estudo também enfatiza que fazer parte do CSI não implica necessariamente que as empresas demonstrem maior nível de divulgação de informações ambientais.

Palavras-chave: agronegócio; divulgação voluntária; índice de sustentabilidade.

1 INTRODUCTION

Discourses on environmental issues and the social and environmental responsibility of companies have been prominent themes in meetings and conferences around the world since the 1950s, especially in developed countries (ASSIS *et al.*, 2010). Thus, in the business context, and compelled by external pressures, companies have started to take actions to mitigate the environmental impacts arising from their economic activities, aiming for the continuity of their business. However, environmental issues continued to be a secondary priority for companies, which led to a significant decline in environmental quality. It was not until the second half of the 20th century that companies began to look at the relationship between economic development and the environment from a new perspective, which is characterised by understanding nature and existing resources and the pursuit of sustainability (SCHREIBER *et al.*, 2016).

From this perspective, Mussoi and Van Bellen (2010) state that companies, as one of the major contributors to environmental degradation, play a significant role in caring for and preserving the environment and finding new technologies that sustainably support these goals. Corroborating this, Wickboldt *et al.* (2017) emphasise that business activity significantly affects the environment to which it is linked, and hence, organisations are expected to inform society about the impact of their operation and use of natural resources on the environment. Therefore, organisations must show, through their financial and non-financial statements, the effect of their operations on the environment, as well as the actions taken to minimise environmental degradation.

Recent policy changes have increased the pressure on companies to strengthen communication on sustainable development. Disclosure of information on sustainability has increasingly appeared in corporate communications, as well as in the description of business models (TRUANT; CORAZZA; SCAGNELLI, 2017; BINI; BELLUCCI; GIUNTA, 2018; LUEG; KRASTEV; LUEG, 2019). In Brazil, there is no obligation or specific regulation that provides for the disclosure of environmental information; it is done voluntarily by companies. However, the Guidance Opinion No. 15/1987 of the Brazilian Securities Commission (CVM), as well as the Standard and Audit Procedure No. 11 of the Institute of Independent Auditors of Brazil (IBRACON), and Resolution No. 1,003/2004 of the Federal Accounting Council (CFC), have some provisions for environmental disclosure (GUBIANI; SANTOS; BEUREN, 2012; CORREA; GONÇALVES; MORAES, 2015).

From this perspective, Brasil, Bolsa, and Balcão (B3) encourage corporate social and environmental responsibility (CSR) through the Corporate Sustainability Index (CSI) (2005), which monitors the performance of environmentally efficient organisations in the capital

market. The index is based on the precepts of the Dow Jones Sustainability Index (DJSI) of the New York Stock Exchange (NYSE). Epstein (2003) states that in the context of socio-environmental disclosure, there must be a balance in the information provided, as one of the greatest difficulties encountered by investors is knowing how to locate such information, which is considered hard work and sometimes unsuccessful. Corroborating this idea, Passetti, Cinquini and Tenucci (2018) emphasise that information can be abundant but confusing, as symbolic information can exist in addition to substantive information. However, the recent literature, in general, favours the view that the quality of disclosure of an environmental nature positively affects the asymmetry of information and environmental performance (SCHRECK; RAITHEL, 2018; REZAEE; TUO, 2019).

Given the above, several studies have been carried out on the voluntary disclosure of environmental information, to scientifically contribute to the advancement of Brazilian research (MURCIA *et al.*, 2008b; ROVER *et al.*, 2012). However, these studies do not focus, for example, on companies operating in agribusiness. Based on the above and considering that the disclosure of environmental information of companies that work with the environment is of paramount importance to the market and society, the research on screening seeks to investigate the environmental disclosure of agribusiness companies and the factors that influence its reporting in the Standardised Financial Statements (DFP) and Sustainability Reports. In this context, the following research question is formulated: What are the factors that influence the disclosure of environmental information of Brazilian agribusiness companies listed in the ISE of B3?

The focus on Brazilian agribusiness is due to the fact that there is a research gap regarding studies on the subject. Having an economic representation of 23% under the Brazilian Gross Domestic Product-GDP, the sector has a high-performance concerning relation that certain economic sectors have with agriculture and livestock. In addition to occupying a remarkable position worldwide in agricultural production, they have a 22% share of the world GDP (ESALQ/USP, 2017).

2 THEORETICAL FRAMEWORK

2.1 Disclosure of Environmental Information

The need for information disclosure generates a series of reports that are prepared and disclosed periodically by companies, which are either mandatory or voluntary, financial or non-financial, to inform stakeholders about their economic activity (HENDRIKSEN; VAN BREDA, 1999). Ozio *et al.* (2018) state that the propagation of environmental information increased considerably after the mid-1980s, with characteristics of development and implementation. The disclosure of this information is no longer understood as merely a marginal activity. Mata, Fialho and Eugénio (2018) add that there are several reasons for its increased importance, such as environmental accidents, the competitive market in which organisations seek a prominent position, organisational culture, and social pressure from regulators, customers, and media, among others.

The environmental disclosure method described by Zhang, Xing e Wang (2020) is a common and convenient method by which companies provide specific regular reports to external stakeholders. Accordingly, recent studies argue that the content present in environmental information disclosure reports is related to the disclosure of non-financial information, past, current, and future environmental performance, and its implementation (ZHANG; XING; TRIPE, 2021). According to Gerged (2021), the disclosure of such information deals with the existing association between a company and the surrounding environment, revealing all responsible actions, consistent with the interests of the organisation, that are taken by organisational management to improve and protect the environment as a whole.

This type of disclosure can encompass critical environmental issues and their effects on the future financial performance of companies, as well as material items of expenses or revenues, environmental policies, and other uncertainties and risks (BIRKEY *et al.*, 2016). However, it should be expected that such issues are of interest to a large group of users, including investors, creditors, and shareholders, who are concerned with environmental sustainability, arising from their economic, social, and political implications (LEHMAN; KURUPPU, 2017).

It is noteworthy that the disclosure of environmental information can be advantageous for improving a company's corporate reputation by reducing the cost of capital and strengthening its bargaining power and market competitiveness (BAE; CHANG; YI, 2018; SARUMPAET; NELWAN; DEWI, 2017). In this scenery, many corporate businesses, regardless of the segment, are increasingly focused on the needs of their stakeholders in social and environmental information (BANI-KHALID; KOUHY; HASSAN, 2017).

2.2 Factors related to the Disclosure of Environmental Information

Companies' disclosure of information regarding the environment is motivated by different reasons. They are subject to numerous pressures, both from favourable and contrary factors (GRAY; BEBBINGTON, 2001). From this perspective, Mussoi and Van Bellen (2010, p. 58) identify some positive and negative points that can influence the disclosure of environmental information. These include: 1. legitimising their current activities, and 2. distracting media attention 3. having a positive impact on stock prices; 4. getting a competitive advantage, and 5. building a positive image of the organisation. On the negative side, the factors include: 1. direct and indirect costs of disclosure, 2. availability of environmental data, 3. lack of legal requirements, and 4. financial focus on the company's priorities. Furthermore, the authors claim that political costs are important in determining the level of voluntary disclosure (MUSSOI; VAN BELLEN, 2010, p. 58). For the authors, there are not only positive and negative factors but also agents that significantly influence entities' disclosure of environmental information. However, the real reasons a company is forced to disclose voluntary environmental information are still unknown (GRAY; BEBBINGTON, 2001; MUSSOI; BELLEN, 2010), but it is probably due to market pressure.

Since the 1970s, studies such as Akerlof (1970) have pointed out that the disclosure of environmental information can be influenced by several factors, and as a priority,

profitability, that is, more profitable companies tend to show more information to be differentiated from others less profitable, thus reducing the risk of adverse selection and informational asymmetry and increasing liquidity. In that study, the proxy used to operationalize was return on assets (ROA). According to Watts and Zimmerman (1978) and Adams (2002), another variable that influences the disclosure of environmental information is company size. The authors are of the opinion that large companies have a greater effect on their community, having more formal processes that involve more people in collecting and organising information, which does not occur in small companies. For this variable, the value of the total assets in their natural logarithms is used.

In the Brazilian scenario, the theme of disclosure of environmental information is considered recent. The following studies have been carried out on this subject, and its possible factors are examined. Lopes (2004) emphasises that a company's indebtedness can motivate environmental disclosure. According to the author, managers have a natural tendency to assume greater risks than desired, thus imposing some restrictions on companies' financing to satisfy the demands of their creditors, thus reducing suspicions about the transparency of their wealth and reducing agency costs.

Murcia *et al.* (2008) and Fernandes (2013) investigate the factors that influence the disclosure of environmental information of companies included in the high environmental impact sector listed on the BOVESPA (São Paulo Stock Exchange), classified as low, medium, and high environmental impact. In the first survey, the following variables are considered for analysis: company size, profitability, indebtedness, auditing, social responsibility and sustainability, and internationalisation. The second survey considers company size, indebtedness, and innovation by adding the level of corporate governance. The results of both the studies show that company size has a positive significance in environmental disclosure, as do performing an audit and being a part of the ISE.

Braga, Oliveira and Salotti (2010) investigate the factors that influence the level of disclosure of environmental information of companies listed in Exame magazine's ranking of Best and Biggest of 2007 and that are part of BOVESPA. As variables, the size of the company, performance, indebtedness, wealth created, nature of the activity, shareholding control, and corporate governance are used. The findings show that company size and wealth created significantly influence environmental disclosure.

Rover *et al.* (2012), in a more comprehensive study of companies in potentially polluting sectors from 2005 to 2007, innovate by seeking to identify whether the variable size, profitability, indebtedness, sustainability, internationalisation, auditing, and sustainability reports influence environmental disclosure. Ratifying previous surveys, size is found to have positive significance in addition to auditing, sustainability, and sustainability reporting.

International research related to environmental disclosure is more consolidated. Hackson and Milne (1996), for example, analyse potential variables that may influence the level of social and environmental disclosure of companies in New Zealand. The findings show that the company's size and nature of economic activity are positively significant for disclosure, while the company's performance is not related at all.

Burgwal and Vieria (2014) analyse the factors that affect the level of environmental disclosure of 28 companies in the Netherlands that were part of the Euronext Stock Exchange (Amsterdam) in 2008. The variables of interest used are company size, industry, and profitability. The findings show that company size and industry have a positive relationship with information disclosure.

In a more recent study, Ohidoa, Omokhudu and Oserogho (2016) investigate the factors determining environmental disclosure of 50 companies listed on the Nigerian Stock Exchange between 2012 and 2015. Company size, industry type, leverage, and profitability are used as the analysis variables. Once again, as confirmed in other surveys, the size of the company and the type of industry are positively significant in terms of environmental disclosure.

Bani-Khalid, Kouhy and Hassan (2017) examine how corporate characteristics can influence the amount of corporate social and environmental disclosure (CSED) in Jordan's manufacturing sector. The main factors investigated are firm size, profitability, audit firm, ownership, type of industry, and level of the financial market. The results indicate that these factors significantly impact the amount of disclosure. The authors also observe that company profitability, age, type of industry, and ownership are not related to information disclosure practices, whether environmental or social.

In the context of corporate practices, Gerged (2021) examines whether internal corporate governance mechanisms affect corporate environmental disclosure in emerging economies. The author uses a sample of 500 company-year observations. The study reports a growing trend in disclosing environmental information among the sample companies during the analysis period. The results suggest that board size, board independence, CEO duality, and foreign ownership have positive associations with environmental information disclosure. This study provides a set of context-specific recommendations for a more coordinated effort to integrate environmental governance and regulations to ensure sustainability in emerging markets.

Ifada *et al.* (2020) examine the effect of environmental performance, independent board of commissioners, and company size on environmental disclosure in the Indonesian scenario. A sample of 117 manufacturing and coal mining companies is used. The results show that environmental performance and company size have a positive effect on financial performance. Meanwhile, the independent board of commissioners does not affect financial performance.

In studies related to the factors of environmental disclosure, little attention has been paid to the role of environmental innovation. Therefore, García-Sánchez, Raimo and Vitolla (2021) study is placed within the context of voluntary disclosure theory, which aims to fill this gap by analysing the impact of environmental innovation on the level of integrated environmental information disclosed by companies and the analysis of environmental performance as a mediating factor in this relationship. The results show that there is a positive relationship between environmental innovation and integrated environmental disclosure and that environmental performance is a mediating factor in this relationship. However, an

important finding is evidenced through complementary analyses: responsible companies adopt silent strategies in their integrated environmental disclosure policies to limit the knowledge of external users of the different environmental actions implemented.

Based on the above, it is clear that environmental disclosure is of interest to researchers both nationally and internationally, which demonstrates the significance of studying this topic, exploring it further, as well as identifying variables for analysis such as company size, indebtedness, and profitability.

2.3 Brazilian agribusiness

Agribusiness was first discussed by Davis and Goldberg (1957), professors at Harvard University, who launched the book "A Concept of Agribusiness," which discusses the interdependence between farmers and entrepreneurs as buyers and sellers. In the authors' view, agribusiness involves a set of operations that relate to the production and distribution of agricultural supplies.

Pinazza and Araújo (1993) and Pereira (2007) argue that agribusiness is a set of all operations and transactions that involve the manufacture of agricultural and livestock inputs, from production operations to the distribution and delivery process, and consumption of agricultural products in their natural or industrialised form. Nunes and Contini (2001) emphasise that agribusiness goes beyond agricultural and agro-industrial activities, including other branches of the economy, such as trade, transport, storage, and financing activities belonging to these sectors. This can be viewed as a new guise to define agribusiness, which considers, in addition to the primary, secondary, and tertiary sectors.

Agribusiness is highly representative of the intersectoral relationships that some economic sectors have with agriculture. This means that this involves economic activities related to agriculture, allowing the accumulation of capital, investments, processes, and technological development (TOMICH; MAGALHÃES; SILVEIRA, 2001). Santos *et al.* (2020) state that in recent years, organisations in the agribusiness segment are increasingly being monitored by society and the public, which is critical in relation to the impacts caused by these organisations and their production systems. This is mainly due to the association of this segment with issues related to sustainability, which, in certain cases, are crucial and controversial. Among these issues, genetically modified foods, animal welfare, and consumer health have been highlighted (EVANS; MIELE, 2012; WESSELER, 2014; SPANHOL-FINOCCHIO; DEWES, 2016; VENUS; DRABIK; WESSELER, 2018).

With a number-based vision, Brazilian agribusiness is seen as a prosperous, modern, competitive, and profitable activity, important to the domestic economy, and is among the best alternatives for the viability of the food sector (STEFANELO, 2008). Accounting for 23% of the gross domestic product (GDP) and 22% of the world GDP related to agricultural production, agribusiness has contributed to a third of the Brazilian GDP for over 20 years. In 2017, it had remarkable performance, with an 11.9% increase in sectoral GDP in agricultural (ESALQ-USP, 2017).

Agricultural exports increased by 14.5% in December 2016, while in December 2017, the growth was approximately 44%, boosted by a significant grain harvest, according to studies by the Instituto de Pesquisa em Economia Aplicada (IPEA, 2018). Commodities such as soybeans and corn grew by 32.1% and 33.9%, respectively. In terms of meat and meat products, the increase was approximately 14% in 2017 (IPEA, 2018).

This shows the potential of this sector. Moreover, Brazil maintains trade relations with more than 180 countries, being the main supplier of sugarcane and coffee and the fourth biggest meat producer: Brazilian poultry, pork, and cattle constitute about 10% of the world production (International Food Policy Research Institute [IFPRI], 2009; SANTINI; PIGATTO, 2009). The IPEA (2018) shows that the Brazilian GDP in 2018 in terms of current values was BRL 6.6 trillion, of which BRL 1.65 trillion came from agribusiness.

This reinforces the importance of agribusiness for the country, showing its global competitiveness, which is achieved through the use of high technology, generating employment and income for the population. It also indicates the responsibility on sectoral companies regarding clarity and objectivity of reported information, which brings certifications and bargaining power to make sales, both in domestic and foreign markets. Therefore, these companies should value voluntary disclosure of information about environmental actions (LUHMANN; THEUVSEN, 2016).

Furthermore, the training of employees is a way to add value to products; thus, agribusiness, in addition to being relevant and competitive, needs operational efficiency and transparency from companies to attract new investments from its creditors. Therefore, carrying out environmental disclosure in a manner consistent with the company's reality is a significant tool to enhance competition in the market.

2.4 Research hypotheses

According to studies related to the proposed theme, hypotheses concerning the determining factors, such as being part of the ISE, company size, indebtedness, and profitability, for the disclosure of voluntary environmental information by companies were stated. Rover *et al.* (2012) point out that the corporate sustainability index is intended to form a portfolio that reflects the performance of considerably sustainable companies. This means that such companies are recognised by the stock market as having a higher environmental performance than others. Thus, companies that belong to the ISE have a greater number of disclosures of environmental information. For delimitation and analysis of the hypotheses, all companies under analysis are Brazilian, from the agribusiness segment with its sectorial subdivisions, and are part of the ISE of B3 (2018). Thus, the dependent variable is the IEA (Environmental Disclosure Index).

To analyse the independent variables which are the factors that influence the disclosure of environmental information, it was observed in the studies by Rover *et al.* (2012) and Fernandes (2013) that the size of the company has a positive relationship with the information disclosed. This is supported by Watts and Zimmerman (1978), Hackson and

Milne (1996), Adams (2002), Burgwal and Vieira (2014), Ohidoa *et al.* (2016), Wachira (2017), Bani-Khalid *et al.* (2017), and Ifada *et al.* (2020). For this variable, the value of the total assets in their natural logarithms is used.

Ifada et al. (2020) prescribe that large companies participate in a greater number of businesses and initiatives aimed at environmental management. Therefore, studies such as Brammer and Pavelin (2006), Patten (1992), Sadia, Tariq and Saba (2015), Habbash (2016), and Johan (2021) present a positive relationship between company size and the level of environmental disclosure. Thus, the first hypothesis for the analysis was formulated.

H1 - Larger companies disclose more environmental information than smaller companies.

According to Akerlof (1970), the profitability of a company can significantly influences the disclosure of environmental information. This is corroborated by Salotti and Yamamoto (2005), who emphasise that a company's performance in terms of revenue is a relevant point to be analysed. The justification is that larger companies need to keep their creditors equipped with as much information as possible and that they are always monitored by the management. Gerged (2021) find a positive relationship between disclosure of environmental information and return on assets. Similar results are found by Li *et al.* (2018) and Xie *et al.* (2019). Thus, the proxy used to operationalise is return on assets (ROA). Thus, we present the second hypothesis.

H2 - Companies with higher profitability disclose more environmental information than companies with lower profitability.

According to Lopes (2004), indebtedness can motivate environmental disclosure, as companies need to inform their creditors to obtain credit in the market. Thus, it is assumed that by increasing the level of information disclosure, investors' perception of risk is reduced, thus reducing information asymmetry. In this sense, it is understood that highly indebted companies have a higher level of disclosure to reduce investors' and creditors' feelings of risk. However, studies such as those by Habbash (2016), and Kouloukoui *et al.* (2019) show that indebtedness is a negative factor in the disclosure of such information. To develop this variable, the relationship between liabilities and assets in percentage points is considered. Following the understanding of Lopes (2004), we propose a third hypothesis.

H3 - Companies with greater indebtedness disclose more environmental information than companies with less indebtedness.

3 METHODOLOGY

3.1 Nature of Research

This study aims to analyse the factors that influence the disclosure of environmental information presented in the Standardised Financial Statements (DFP) and in the Sustainability Reports of the companies listed in the ISE, and that operate in Brazilian

agribusiness, comprising their economic sectors and subsectors, according to Table 1.

Table 1 - Sectors, subsectors and segments of the companies that make up the Corporate Sustainability Index (CSI) listed on the BOVESPA in 2019.

Sector	Subsector	Segment
Cyclic Consumption	Fabric, clothing, and footwear; business.	Footwear; fabrics, clothing, and footwear; yarns and fabrics.
Non-Cyclical Consumption	Beverages, agriculture/processed foods; products for personal use and cleaning.	Beers and soft drinks; sugar and alcohol; agriculture; meats and meat products; miscellaneous foods; products for personal use and cleaning.
Basic Material	Mining, chemicals; wood and paper; steel and metallurgy.	Metallurgical minerals; petrochemical; wood; paper and cellulose; copper artifacts; various chemicals.
Oil/Gas/Biofuel	Oil, gas, and biofuel.	Exploration/refining and distribution.

Source: Elaborated by the authors (2018).

The research is defined as desk research, classified as exploratory descriptive, with a quantitative approach, and was carried out through document analysis. The aim of exploratory research is to provide greater familiarity with the problem to be examined in other words, it is a way to seek more information to make the researcher more confident about the topic (MARCONI; LAKATOS, 2019).

According to Martins and Domingues (2019), the objective of a descriptive study is to describe the characteristics of a certain population or phenomenon, as well as the establishment of the variables. Marconi and Lakatos (2019, p. 174) define documental research's main characteristic as its data collection source being "restricted to documents, written or not, constituting what is called primary sources." This means that the information will be reorganised for a better understanding of the outlined objectives, which in this research consists of the search for information regarding the disclosure of socio-environmental information in the sustainability reports provided by the companies in question.

As for the quantitative approach, Martins and Theóphilo (2007) provide an explanation of the causes, through objective measures, using tests and statistics, allowing the researcher to summarise, characterise, and interpret the numerical data collected according to the nature of the information.

3.2 Data collection and analysis

The research universe comprises the 179 companies listed in the 2018 B3 Corporate Sustainability Index (ISE) with a 2017 base year.

Meanwhile, the sample consists of 41 companies related to agribusiness, with a non-probabilistic distribution of sectors, subsectors, and segments according to the sectorial

classification of Brasil Bolsa e Balcão (2018). The inclusion criteria were having shares listed on the Stock Exchange (B3) and being part of the Corporate Sustainability Index (ISE), which motivates them to disclose their financial and non-financial statements, thus facilitating data collection.

Regarding data collection, a research instrument was developed based on the ISE Questionnaires (2018) available on the B3 website (2018), which are sent to companies that address questions related to the environmental, financial, and social dimensions. However, the focus of this research is to analyse only the information of an environmental nature, which has three different questionnaires, organised by group.

Group A includes companies that have reference environmental aspects: natural and renewable resources, which include beers and soft drinks, cigarettes and tobacco, wood, paper and cellulose, water and sanitation, electricity (generation and transmission), sugar and alcohol, agriculture, and livestock (production).

Group B includes reference environmental aspects: natural and non-renewable resources, including companies operating in the following segments - copper artifacts, iron and steel, fertilisers, metallic minerals, oil and gas (exploration and/or refining), petrochemicals, animal feed, and steel.

Finally, group C is related to the environmental aspects of reference: raw materials and inputs, which are part of it (accessories, threads and fabrics, weapons and ammunition, cars and motorcycles, various foods, toys and games, shoes, computers, and equipment, civil construction, heavy construction, leather, pesticides, medicines, packaging, electrical equipment, household appliances, exploration of highways (considering the activities of duplication, maintenance, expansion), dairy products, agricultural and transport machinery and equipment, hospital machinery and equipment, industrial machinery and equipment, aeronautical material, railway material, road material, bicycle assemblers, engines, compressors, and others; cleaning products; personal products; household utensils; clothing).

All questions were organised so that their answers were binary or dichotomous, with 1 for yes (evidence) and 0 for no (no evidence). Thus, a checklist was developed, with 37 questions from the environmental dimension, separated according to criteria and sub-criteria, as shown in Table 2.

Table 2 - Criteria and sub-criteria presented in the environmental dimension were prepared based on the Corporate Sustainability Index Questionnaire listed on the BOVESPA in 2019.

Environmental dimension	
Criteria	**Sub-criteria**
Policy	Commitment, scope, and disclosure.
Management	Environmental responsibility; Management and monitoring; Certifications; Communication with interested parties; Global commitment: biodiversity and ecosystems.

Performance	Consumption of environmental resources; Atmospheric emissions, liquid effluents, and waste. Critical environmental aspects; Environmental insurance.
Legal compliance	Permanent preservation and rural environmental registry; Legal reserve; Environmental liabilities; Administrative requirements; Administrative procedures; Court proceedings.

Source: Elaborated by the authors (2018).

Economic-financial data related to the explanatory variables were obtained from the B3 website. For document analysis, we consulted the Standardised Financial Statements (DFPs) and Annual Sustainability Report with the 2017 base year, available on the websites of the companies analysed.

The information collected was organised and treated statistically to verify the significant correlations between the dependent variable and independent variables using the statistical software R ver. 3.5.2.

To calculate the correlation, Pearson's correlation was used following Hinkle et al. (1988). Subsequently, to verify whether the correlations between the dependent variable and independent variables were significant, a beta regression model was used (FERRARI; CRIBARI-NETO, 2004). The statistical significance of the hypotheses was evaluated at the 5% level.

3.3 Measurement of the dependent variable

The dependent variable was the IEA, which was measured by applying the content analysis technique in Management Reports, Explanatory Notes, Sustainability Report, Social Report, the latter when available, on the website of the companies in the sample in 2017. Formula: Environmental **disclosure index = answers obtained/total questions.** The following results were obtained based on the IEA, as presented in Table 3, which shows the number of companies by sector and their representation in percentages.

Table 3 - Sectors, number and percentage of companies that make up the Corporate Sustainability Index (CSI) listed on the BOVESPA in 2019.

Sector	No. of companies	(%)
Cyclical Consumption	10	24.39%
Non-Cyclical Consumption	13	31.71%
Basic Material	13	31.71%
Oil/Gas/Biofuel	5	12.20%
Total	41	100%

Source: Research data (2018).

3.4 Measurement of independent variables

H1 indicates that larger companies disclose more environmental information than smaller companies and is related to the size of the companies. In the screening research, the logarithm (In) of the total assets was considered.

In H2, which states that companies with higher profitability disclose more environmental information than companies with lower profitability, return on assets (ROA) was taken, which is the ratio of operating profit to total assets.

Finally, in H3, which states that companies with higher indebtedness disclose more environmental information than companies with lower indebtedness, the natural logarithm (In) of total liabilities was taken.

Therefore, to answer the elaborated hypotheses, a beta regression model was formulated, in which the relationship between the independent variables and the model mean is given as follows:

$$\log(\frac{\mu_{it}}{1-\mu_{it}}) = \alpha_0 + \beta_1 lnAT_{it} + \beta 2ROA_{it} + \beta_3 lnET_{it}$$

Where:

μít: represents the mean of the IEA, that is, the mean of the IEA modelled using the independent variables. In other words, we analyse how the average IEA behaves when the independent variables are changed.

IEAít: Environmental Disclosure Index, dependent variable to measure the amount of information disclosed about company i in year t.

LnATít: Natural logarithm of Total Assets, which represents the size of company i in year t.

ROAít: Return on Assets, which measures the company's performance through the Operating Profit of company i in year t.

LnETít: Natural logarithm of Total Liabilities, which measures the indebtedness of company i in year t.

4 RESULTS

4.1 Descriptive statistics

Table 4 presents the descriptive statistics for the quantitative variables of the research. Based on the above results, it is clear that the companies that were part of the sample had an average environmental disclosure index (IEA) of 59%, which shows that most companies complied with the ISE requirement, that is, greater disclosure and environmental information.

Table 4 - Descriptive statistics of the Environmental Disclosure Index (IEA) and Return on Assets (ROA) variables of the companies that make up the Corporate Sustainability Index (CSI) listed on the BOVESPA in 2019.

Variable	Obs.		Average	Standard Deviation	Minimum	Maximum
IEA	41	0.59		0.32	30%	92%
Total Assets	41	*n*	R$ 8.635.436,03	R$ 53.910.308,02	R$ 681.187,07	R$ 328.096.710,66
		ln	15,991225	1,5191684	13,431592	19,608818
ROA	41		2,6346	2,5485987	-2,324244	11,639648
Indebtedness	41	*n*	R$ 55.368,36	R$ 26.609,87	R$ 10.022,32	R$ 121.394,11
		ln	3,884679	0,570019	2,304814	4,799042

Source: Research data (2018).

Regarding the total assets of the companies, after analysing the minimum and maximum values, it was observed that the size of the companies was quite different, which indicates that both larger and smaller entities were able to fulfil the requirements of the ISE.

Regarding the return on assets (ROA) of the companies in question, a good economic performance is inferred, the average is 2.63, that is, the return on total assets that the company put to use is 2.63 times, the analysis of this indicator states that the bigger the better. The value of the minimum standard deviation is highlighted because four companies had a negative operating income in 2017, while the maximum standard deviation of 11.63 demonstrated a highly significant ROA.

Table 5 - Descriptive statistics of dummy variables (0 = not disclosed and 1 = disclosed) by sector (Cyclical Consumption, Non-Cyclical Consumption, Basic Material, Oil/Gas/Biofuel) of companies listed in the Corporate Sustainability Index (CSI) on the BOVESPA in 2019.

Sector	Obs.	Type	*n*	*I*
Cyclical Consumption	10	0) Does not disclose	254	68.65%
		1) Disclose	116	31.35%
		Total	370	100.00%
Non-Cyclical Consumption	13	0) Does not disclose	198	41.16%
		1) Disclose	283	58.84%
		Total	481	100.00%
Basic Material	13	0) Does not disclose	214	44.49%
		1) Disclose	267	55.51%
		Total	481	100.00%
Oil/Gas/Biofuel	5	0) Does not disclose	106	56.99%
		1) Disclose	80	43.01%
		Total	186	100.00%

Source: Research data (2018).

Based on this table, it appears that not all companies listed on the ISE disclosed environmental information in its entirety. The most non-disclosures were of companies in the cyclical consumption sector, which are associated with the final segment of products, such as footwear, fabrics, clothing, yarns, and fabrics, and companies in the oil, gas, and biofuel sector, who work in exploration/refining and distribution, with percentages of disclosure 68.65% and 56.99%, respectively.

These results are contrary to the literature, since companies in the oil, gas, and biofuel sector are considered to have a high environmental impact. Specific legislations and periodic inspections are in place regarding their economic activities, which are directly linked to the environment, such as oil extraction (Murcia *et al.*, 2008b). As for cyclical consumption companies, according to Fernandes (2013), even if they use tanneries to process raw hide for the production of shoes and accessories, they are considered to be part of agribusiness. However, they have less contact with the environment, thus reducing the amount of information that needs to be disclosed.

Regarding the disclosure of environmental information, it is found that companies in the non-cyclical consumption sector (beverages, agriculture/processed foods, personal use, and cleaning products) accounted for 58.84%, and basic material (mining, chemicals, wood and paper, steel, and metallurgy) accounted for 55.51%.

It should be noted that among non-cyclical consumption companies, according to the literature, there is a greater demand for the conscious use of natural resources, as companies have specific legislation to follow. They also face pressure to improve the efficiency of their production processes and decrease the pollution caused, which encourages them to demonstrate what they have done regarding the capture, use, and reuse of water, the waste generated, the way they are discarded, and the recycling policy (Murcia *et al.*, 2009; Rover *et al.*, 2012; Wickboldt *et al.*, 2017).

The table shows the criteria for greater disclosure of environmental information by companies. The focus is on the management criteria developed by the companies, for which unanimous responses were obtained.

Table 6 - Descriptive statistics of dummy variables (0 = not disclosed and 1 = disclosed) concerning the criteria (Policy, Management, Performance and Legal Compliance) of the environmental dimension of companies listed in the Corporate Sustainability Index (ISE) on the BOVESPA in 2019.

Criterion	Obs.	Type	*n*	No. of questions	*I*
Policy	41	0) Does not disclose	9	2	21.95%
		1) Disclose	12		71.05%
Management	41	0) Does not disclose	0	15	0%
		1) Disclose	41		100%
Performance	41	0) Does not disclose	12	11	29.27%
		1) Disclose	29		70.73%
Legal Compliance	41	0) Does not disclose	10	9	24.39%
		1) Disclose	31		75.61%

Source: Research data (2018).

This requirement addresses issues regarding the environmental responsibility of companies, which, based on document analysis, are made from a set of procedures that are most often external to the company. When the legal obligation, or even regularisation of the company with regard to rural and forest certifications takes place internally, with the management and monitoring of its internal processes ensuring that production is efficient, reducing labour, rework, energy, and excessive waste disposal in the environment, it consequently leads the organisation to cleaner production.

The political criterion, with an information disclosure percentage of 78.05%, seeks to identify whether the companies' corporate policy aspects are directed toward sustainable and social development, which takes into account not only the environment, but also the health and safety of employees. Going beyond the limits of dichotomous variables but based on document analysis, we observed that the organisations maintain well-structured policies to support their collaborators fully. In addition to the strict criteria regarding relationships with suppliers, when it comes to the supply of raw materials and certifications of the products sold, among other factors, such findings have not yet been reported in previous studies.

The legal compliance criterion of 75.61% is related to the quality certifications that companies have obtained and maintained over time, and the separation of amounts for Legal Reserve and Contingency Reserve is also carried out in accounting terms, in case any involuntary incident occurs (fire, burning, loss due to floods, etc.) and the company has to reduce its production process or even close it down. The question of certifications is well evidenced in the reports; however, reservations are not. The literature asserts that this occurs because companies need to show their investors and shareholders that the company is well and trustworthy, thus reducing possible suspicions about its image (Braga *et al.*, 2010)

With regard to the performance criterion, 70.73% of the information was provided. This item emphasises that organisations must present, in their results, the extent of CO2 emitted into the atmosphere and the generation and disposal of solid waste into the environment. The documentary analysis allowed us to infer that even with disclosure, such information in the reports is "vague," and hence its identification is difficult. Previous studies indicate that the tendency is to disclose minimum information that can create a negative image of the company, and when disclosed, such information is often incomplete (COSTA; MARION, 2007). This was confirmed in the screening study.

4.2 Model results

The dispersion and correlation graphs of the studied variables are presented in Fig. 1.

RRCF, Fortaleza, v.13, n. 2, Jul. /Dez. 2022
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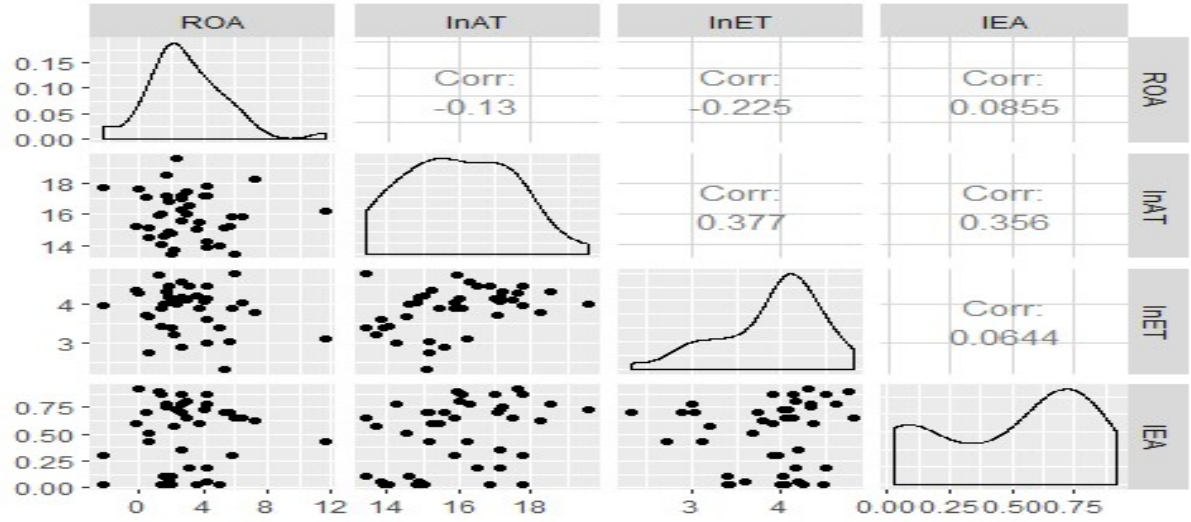
Figure 1 - Figure 1. Correlation between the variables Returns on Assets (ROA), Natural Logarithm of Total Assets (LnAT), Natural Logarithm of Total Liabilities (LnET) and the Environmental Evidence Index (IEA).



Source: Research data (2018).

Based on Fig. 1, it can be seen that there is a weak correlation between the environmental disclosure index (IEA) and the natural logarithm of total assets (LnAT), the value of Corr. = 0.356. There is a negligible correlation between IEA and ROA and IEA with the natural logarithm (LnET) at Corr. = 0.0855 and 0.0644, respectively.

These results suggest that H1 is confirmed, that is, as the company's size increases, the IEA also tends to increase (IEA with Corre.= 0.356 LnAT, as shown in Fig. 1).

This hypothesis was confirmed in other studies that also used the size variable for investigation, such as Watts and Zimmerman (1978), Adms (2002), Murcia *et al.* (2008), Braga *et al.* (2010), Rover *et al.* (2012), Fernandes (2013), and Burgwal and Vieira (2014).

It is important to highlight that Murcia et al. (2008) take into account the fact that companies are listed on the ISE, and Rover *et al.* (2012) consider sustainability reports among the variables. It is observed that being listed in the ISE does not necessarily mean that reports will be complete, as pointed out in Table 5. As for the location of the documents, sustainability reports have a greater amount of environmental information, without following standards regarding their reporting.

As for H2 and H3, they cannot be descriptively verified. Therefore, there is no evidence to believe that the greater the profitability (ROA) and indebtedness (LnET), the more the environmental information disclosed, according to the correlation found in the model.

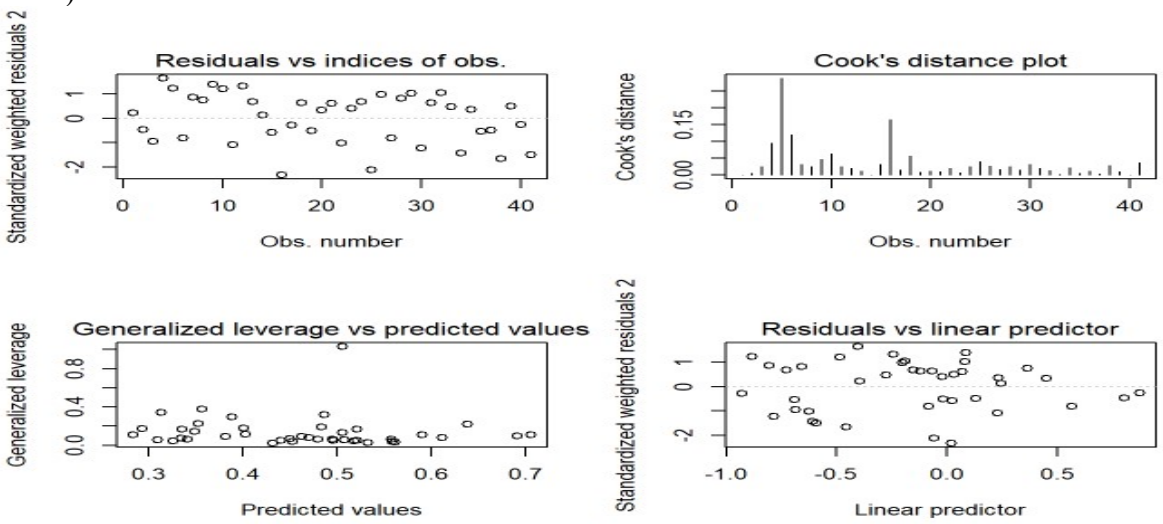
For the hypothesis that deals with ROA, Akerlof (1970) and Braga et al. (2010) provide a counterpoint, because in these studies, the ROA has positive significance. However, the research on screen is supported by Hackson and Milne (1996) and Ohidoa *et al.* (2016), who show that the return on assets does not influence the disclosure of environmental information.

H3 deals with the natural logarithm of total debt (LnET), that is, the more indebted they are, the more information is evidenced, and Braga *et al.* (2010) and Rover *et al.* (2012) prove that there is no relationship since the results are not significant, which is corroborated in this study. The statistical veracity of the hypotheses is presented in sequence, according to the beta regression model.

4.3 Waste analysis

It is important to emphasise that the quality of the model's fit was verified through the graphs presented in Fig. 2, which shows that there is no visual evidence that the model has a problem in its fit, that is, there is a lack of pattern in the residuals.

Figure 2 - Adjustment of the Beta Regression model, which contains as dependent variable the Environmental Evidence Index (IEA) and independent variables Return on Assets (ROA), Natural Logarithm of Total Assets (LnAT) and Natural Logarithm of Liabilities Total (LnET).



Source: Research data (2018).

After analysing the residuals, it is possible to statistically infer that H1 is true; that is, as the size of the company-natural log of total assets (LnAT) increases, the average of the IEA also increases. This is because the estimated coefficient of LnAT is positive. As for H2 and H3, we obtain no statistical evidence.

Table 7 - Result of the model that demonstrates the estimated values and standard error of the dependent variable (constant), Environmental Evidence Index (IEA) and of the independent variables - Return on Assets (ROA), Natural Logarithm of Total Assets (LnAT) and Natural Logarithm of Total Liabilities (LnET), of the analyzed companies.

Variable	Estimate	Standard Error	p-value
Constant	-4.62711	1.99197	0.0202*
ROA	0.06240	0.06895	0.3655
*Ln*AT	0.30272	0.12399	0.0146*
*Ln*ET	-0.14446	0.32919	0.6608
R^2 0.1525			

Source: Research data (2018).
Note: *. Significant at level 0.05.

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