



ANALYSIS OF ESG MEASURES ADOPTED BY BRAZILIAN ORGANIZATIONS LINKED TO AGRICULTURE AND FORESTRY LISTED IN ISE B3

*Análise das medidas ESG adotadas por organizações brasileiras ligadas
a agropecuária e floresta listadas no ISE B3*

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ABSTRACT

The climate changes our planet is undergoing are causing various negative environmental and social effects, and today's actions will determine how nature responds to increasing climate risks. Therefore, swift actions are needed to adapt to these changes, aiming to contain cascading effects that are difficult to manage. This requires a global effort in mitigation and adaptation measures, demanding strong commitment from all stakeholders—governments, businesses, consumers, and civil society organizations. Thus, this article aims to identify and discuss the actions developed based on the ESG best practices of organizations downstream of the agricultural production chain, which work with raw materials from agriculture, livestock, and forestry. These organizations are listed on the Corporate Sustainability Index (ISE) and were analyzed through descriptive research and comparative analysis of sustainability reports available on company websites and provided to the public. Consequently, the study seeks to understand how governance structures are organized and engaged with sustainability issues, offering insights into how these practices bring economic, social, and environmental benefits to companies and society.

Keywords: Corporate sustainability index, Sustainability reports, ESG indicators

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ANÁLISE DAS MEDIDAS ESG ADOTADAS POR ORGANIZAÇÕES BRASILEIRAS LIGADAS A AGROPECUÁRIA E FLORESTA LISTADAS NO ISE B3

*Analysis of ESG measures adopted by brazilian organizations linked
to agriculture and forestry listed in ISE B3*

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RESUMO

As mudanças climáticas pelas quais passam o nosso planeta estão causando vários efeitos ambientais e sociais negativos, e as ações de hoje definirão como a natureza responderá ao aumento dos riscos climáticos. Logo, são necessárias ações rápidas para adaptações a essas mudanças, tendo em vista conter efeitos cascatas difíceis de gerenciar, a partir de um esforço global de ações de mitigação e adaptação que vão requerer um forte compromisso de todos os agentes - governos, empresas, consumidores, entidades da sociedade civil. Assim, este artigo está direcionado para identificar e discutir as ações desenvolvidas com base nas boas práticas de ESG de organizações, jusante da cadeia produtiva agrícola, que atuam com matéria prima oriunda da agropecuária e floresta, listadas no Índice de Sustentabilidade Empresarial (ISE), através de pesquisa descritiva e análise comparativa dos relatórios de sustentabilidade observados nos sites das companhias e disponibilizados à sociedade. Portanto, busca-se entender como as governanças estão estruturadas e engajadas com o tema da sustentabilidade, apresentando compreensões de como essas práticas trazem benefícios econômicos, sociais e ambientais para as companhias e para a sociedade.

Palavras-chave: Índice de sustentabilidade empresarial, Relatórios de sustentabilidade, Indicadores ESG

INTRODUCTION

Nowadays, the incorporation of sustainable practices into company strategies has become essential, and ESG (Environmental, Social and Governance) emerges as an indispensable reference for companies that seek to generate a positive impact. Cruz (2022) adds that the inclusion of sustainability in corporate strategic planning must be understood precisely to ensure that the planet remains in conditions of use and enjoyment for future generations, and that these generations can live with dignity, in line with the expectations of customers, suppliers, creditors and other stakeholders.

According to Costa and Ferezin (2021), the importance given to this exercise of citizen awareness is being incorporated by people all over the world who desire a better future. Organizations are following the same reasoning, debating and adopting the term ESG (Environmental, Social and Corporate Governance) as a compass for directions to be followed and analyzed. Quinto et al. (2021) add that, for a company to be recognized as following ESG principles, it must have initiatives for environmental protection that bring benefits to the environment; good social engagement practices, such as diversity policies and other initiatives that promote community well-being; and honest corporate processes aimed at tax transparency and the prevention of corruption, discrimination and harassment.

It is not by chance that authors state: “Therefore, administrative innovations – under appropriate circumstances – can be as or more relevant than technological innovations to ensure effectiveness and performance.” (RANGEL et al., 2024, p. 3).

Fernandes and Linhares (2017) point out that ESG practices have become increasingly vital in investors’ decision-making processes. Information on how a company minimizes its environmental impacts, builds a fairer and more responsible world for the people around it, and maintains the best management processes is now present in capital market discussions. Public pressure and national and international regulators are increasingly holding companies responsible not only for their own actions, but also for the impacts caused by the entire chain in which they are involved.

Still according to these authors, the environmental dimension seeks to conserve and manage environmental resources, which are essential to support life and are not renewable. The social dimension consists in promoting a fair society with social inclusion, focused on ending poverty, avoiding any form of human exploitation and pursuing the well-being of local communities. In the governance dimension, the focus is on social and environmental impacts, seeking to anticipate risks that may also affect economic performance.

In this context, agribusiness stands out as the driving force of the national economy and remains a sector with a high capacity to generate jobs and income. Occupying a prominent position worldwide, it plays an increasingly important role in the process of economic development, being a dynamic sector that drives other sectors (industry, trade, tourism, among others) (CREPALDI, 2020).

Thus, it is understood that agribusiness organizations also need to be strongly concerned about the environmental and social effects of their actions. They must manage environmental, social and governance risks and embrace a sustainable culture.

Vial et al. (2012) explains that agribusiness includes both upstream and downstream industries in the agricultural production chain. The upstream industries are responsible for producing capital goods and industrial inputs or for offering products and services to agriculture and livestock. Downstream industries include those that transform or process agricultural raw materials into finished products, adding value to the product. In summary, the upstream sector of the farm consists of consumer and capital goods for rural areas, while the downstream sector comprises complex networks of storage, transport, processing, industrialization and distribution.

Therefore, recognizing the importance of agribusiness for the Brazilian economy, this study has the general objective of analyzing the adoption of ESG measures by organizations downstream in the agricultural production chain, which work with raw materials from agriculture, livestock and forestry, and which are listed in the Corporate Sustainability Index (ISE) of B3 – Brasil, Bolsa, Balcão.

This work is aligned with the following specific objectives:

a) To identify the downstream organizations in the agricultural production chain that work with raw materials from agriculture and forestry, are listed in the ISE B3, base their strategies on ESG practices, and report their sustainability performance.

b) To identify and analyze the actions developed by these organizations based on ESG best practices, by means of descriptive research and a comparative study of sustainability reports available on their websites and made public.

1 METHODOLOGY

This study is characterized as qualitative and descriptive research and also makes use of a comparative study. According to Marconi and Lakatos (2012), descriptive research seeks to report the characteristics of a given population or phenomenon or to establish relationships between variables, confirming that these sources are characterized as primary sources.

The authors also classify written documents as official documents, which generally constitute the most reliable data source, and the researcher must take great care in interpreting what is described. Cervo and Bervian (2002) likewise state that descriptive research focuses on describing the characteristics of a population or phenomenon.

According to Marconi and Lakatos (1983), the comparative method makes it possible to analyze concrete data, deducing from the text under analysis the elements available for their examination.

For the research sample, organizations downstream in the agricultural production chain that work with raw materials from agriculture and livestock, listed in the Corporate Sustainability Index of B3 and active in 2022, were selected. The study was limited to organizations listed in the ISE because they report more extensive information about their ESG practices, validated by B3 and the Brazilian Securities and Exchange Commission (CVM).

The Corporate Sustainability Index (ISE) was created in 2005 by the Brazilian Stock Exchange and is intended to be a benchmark for companies that stand out in promoting good sustainability practices (TEIXEIRA et al., 2011).

This index is made up of organizations selected according to the methodology presented on the B3 website, that is, companies that are approved in the specified criteria and meet a series of requirements. After completing questionnaires and submitting documentation, scores are assigned for the companies' practices and these scores generate rankings. This makes it possible to identify which companies best meet ESG requirements in Brazil and to compare organizations in terms of their sustainability practices. The approved organizations make up the ISE B3 portfolio.

In the 17th ISE B3 portfolio in 2022, 48 organizations were listed, as shown in Table 1 below.

Table 1 - Composition of the 17th ISE B3 portfolio

SECTORS	QTY
Air and rail transport	2
Industrial machinery and equipment	1
Highway concessions	2
Cars and motorcycles	1
Home appliances	2
Miscellaneous products	1
Textiles, clothing and footwear	2
Civil construction	1
Car rental	1
Oil, gas and biofuels / exploration, refining and distribution	2
Health / medical and hospital services, analysis and diagnostics	2

SECTORS	QTY
Telecommunications	2
Electric power, water and sanitation	10
Personal care and cleaning products	1
Financial / insurance companies	9
Food retail	1
Diversified food products	1
Petrochemicals	1
Meat and meat products	3
Pulp and paper	2
Wood	1
TOTAL	48

Source: Prepared by the authors

Of the 21 sectors, only the last three were selected for the study, since the aim was to analyze only downstream organizations in the agricultural production chain that work with raw materials from agriculture and forestry.

Therefore, according to the ISE B3 ranking for 2022, Table 2 shows the organizations that are in the sectors highlighted above.

Table 2 - Organizations downstream in the agricultural production chain that work with raw materials from agriculture and forestry and that are part of the 17th ISE B3 portfolio

CORPORATE NAME	SECTOR	ISE B3 2022 RANKING	BUSINESS
KLABIN	Pulp and paper	6	Forest plantations of eucalyptus and pine
SUZANO	Pulp and paper	9	Forest plantations of eucalyptus and pine
DEXCO	Wood	22	Forest plantations of eucalyptus and pine
BRF	Meat and meat products	27	Livestock farming
MARFRIG	Meat and meat products	34	Livestock farming
MINERVA	Meat and meat products	44	Livestock farming

Source: ISE B3 and company websites

After selecting the companies which make up the study sample, the Sustainability Reports of the six organizations selected for the period from 2020 to 2022 and made available on the companies' websites were carefully read, in order to understand how ESG practices are carried out by these organizations.

The actions are discussed separately in the environmental, social and governance dimensions.

Within each dimension, key indicators were selected to monitor and measure different aspects related to ESG issues, and which best show the benefits brought by the strategies implemented by each company. In addition, the selected indicators must appear in all sustainability reports that follow the Global Reporting Initiative (GRI) presentation standard. These indicators are shown in Table 3.

Table 3 - Indicators selected for the analysis of ESG dimensions

ENVIRONMENTAL DIMENSION	Reduction of GHG emissions
	Carbon dioxide capture
	Percentage of energy matrix from renewable sources
	Reduction in water consumption
	Reuse of industrial waste
SOCIAL DIMENSION	Training and development
	Female leaders
	Employees belonging to diversity groups
	Accident frequency rate with leave of absence
	Community-related indicators
	Suppliers assessed on social and environmental criteria
CORPORATE GOVERNANCE DIMENSION	Cases received and resolved by the whistleblowing channel
	Confirmed cases of corruption and/or misconduct

Source: Prepared by the authors

Based on the data obtained through documentary research, a comparative analysis was carried out for the indicators reported by the organizations.

2 RESULTS AND DISCUSSION

First, a general analysis of the companies was carried out, with general information about each one. Then, a comparative analysis of the selected indicators from the sustainability reports is presented.

General information about the companies

The forest-based companies are Klabin S.A., Suzano S/A and Dexco S/A, and the companies engaged in livestock (animal farming) are BRF, Marfrig and Minerva.

The information below was taken from the companies' websites.

Klabin S.A. offers solutions in pulp, paper and packaging, producing pulp used to manufacture sanitary papers, disposable absorbent products, packaging papers, printing and writing papers, as well as corrugated cardboard packaging (KLABIN, 2023).

According to its website, Suzano S.A. is a forest-based company, has been operating for more than 90 years and is 100% Brazilian. Its main products are market pulp, printing and writing paper, paperboard, toilet paper, paper towels, straws, cups and disposable packaging (SUZANO, 2023).

Duratex S.A. Indústria e Comércio was founded in 1951 and, after 70 years in operation (2021), it changed its name to Dexco. It produces and sells MDP (Medium Density Particleboard) and MDF (Medium Density Fiberboard) panels; laminate and vinyl flooring, floor and wall coverings and tiles, sanitary ware, metal fittings, showers and taps (DEXCO, 2023).

BRF was created from the merger of Perdigão and Sadia, completed in 2012. Its products include frozen and marinated chicken, turkey and chester meat, special and processed meats, frozen ready meals, margarine, butter, cream cheese, sandwiches, vegan products and animal feed. It owns the brands Sadia, Perdigão, Qualy, Perdix, Confidence, Banvit and Hilal (BRF, 2023).

Marfrig was founded in 2000 and owned the Seara brand, which was acquired by JBS in 2014. After that, it became Marfrig Global Foods. It focuses on the production of food based on animal protein, mainly hamburgers, and also offers a variety of products such as frozen vegetables, lamb, fish and sauces. Its brands include Bassi Angus, Bassi, Montana, Montana Steakhouse, Viva, GJ, Revolution, Bona Pet, Plant Plus Foods and Pampeano (MARFRIG, 2023).

Minerva operates in the production of beef, lamb and processed foods, and owns the brands Ana Paula Black Angus, Estância 92, Minerva, Cabana Las Lilas and Pul. In 2012, it started using the Minerva Foods brand and is structured into the Brazil division, the Latam division (Argentina, Colombia, Paraguay and Uruguay) and the Australia division, acquired in November 2021 (MINERVA, 2023).

Table 4 presents general data to better identify the companies, as well as to better understand their business and size.

Table 4 - General information about the companies

DATA	KLABIN	SUZANO	DEXCO	BRF	MARFRIG	MINERVA
Production centers	22 factories in Brazil and 1 in Argentina. Total area: 719 thousand ha	11 factories in Brazil. Total area: 2.6 million ha	3 factories in Colombia and 16 in Brazil. Area: 157,644 thousand ha	Brazil – 35 factories and 22 DCs. Abroad – 23 factories and 27 DCs	33 production units, 10 distribution centers	33 production units, 14 distribution centers
Total employees	25,000 direct and outsourced workers	42,675 direct and outsourced workers	13,575 direct workers	96,227 direct workers	34,557 direct workers	23,207 direct workers
Production capacity	Pulp: 1.6 million t/year Paper: 2.6 million t/year	Pulp: 10.9 million t/year Paper: 1.4 million t/year	MDP and MDF: Brazil: ~1.8 million m ³ /year each. Colombia: ~0.3 million m ³ /year.	Production of 5.5 million t of food in 2022	Slaughter capacity: 35,600 head of cattle/day. Hamburger production: 247	Slaughter capacity: 48,566 head of cattle/day.

DATA	KLABIN	SUZANO	DEXCO	BRF	MARFRIG	MINERVA
			Deca: ~45 million m ² /year. Coatings: ~31 million m ² /year		thousand t/year. Other processed products: 209 thousand t/year	Finished products: 1.7 million t

Source: Prepared by the authors. Sustainability reports of the companies surveyed (2023)

Analysis of the companies' sustainability reports

The results presented here refer to the period from January 1, 2020 to December 31, 2022, and were taken from the Sustainability Reports. For better understanding, the analysis is divided into the Environmental, Social and Corporate Governance dimensions.

Environmental dimension

Companies adopt a set of responsible practices in the use of natural resources in order to protect the environment. To present these practices, the most used indicators for managing the environmental dimension in organizations were selected, as shown in Tables 5 and 6.

Table 5 - Environmental indicators of forest-based organizations

ENVIRONMENTAL DIMENSION INDICATORS RELATED TO TARGETS (2020 TO 2022)	FOREST-BASED ORGANIZATIONS		
	KLABIN	SUZANO	DEXCO
Reduction of GHG emissions in Scopes 1 and 2, from the baseline	14.3% (Baseline: 2019)	8% (Baseline: 2015)	43.68% (Baseline: 2019)
Carbon dioxide capture (accumulated from 2020 to 2022)	15 million tCO ₂ e	22 million tCO ₂ e	1.9 million tCO ₂ e
Percentage of energy matrix from renewable sources	90.90%	88.14%	55.60%
Reduction in water consumption (m ³ /t), from the baseline	17.8% (2019)	8.2% (2020)	15% increase in water intake (2020)
Reuse of industrial waste (2022)	98.5% of waste reused	81.6% of waste reused	91% of waste reused

Source: Prepared by the authors

Table 6 - Environmental indicators of livestock-related organizations

ENVIRONMENTAL DIMENSION INDICATORS RELATED TO TARGETS (2020 TO 2022)	LIVESTOCK-RELATED ORGANIZATIONS		
	BRF	MARFRIG	MINERVA
Reduction of GHG emissions in Scopes 1 and 2, from the baseline	21% (Baseline: 2019)	30% (Baseline: 2019)	8.23% increase in emission intensity (2020)
Carbon dioxide capture (accumulated from 2020 to 2022)	No information	No information	No information
Percentage of energy matrix from renewable sources	90%	45.00%	100%
Reduction in water consumption (m ³ /t), from 2020	4.29%	5.48% increase in water intake	55.4% increase in water intake
Reduction of solid waste sent to landfill	28% of total waste produced sent to landfill	30.5% of total waste produced sent to landfill	18.7% of total waste produced sent to landfill

Source: Prepared by the authors

Below is an analysis of each environmental indicator.

Reduction of GHG emissions

The constant effort to reduce greenhouse gas (GHG) emissions is one of the items in the companies' Sustainability Policies. They have GHG inventories in line with the recommendations of the Brazilian GHG Protocol Program. The inventories monitor GHG emissions, taking into account direct and indirect emissions from operations in Scopes 1, 2 and 3.

For forest-based companies, the GHGs included in the calculation of direct (Scope 1) and indirect (Scope 2) emissions are CO₂, N₂O, CH₄ and HCFCs. For livestock-related companies, Scope 1 includes enteric fermentation (cattle belching), manure management (decomposition of manure in feedlots), stationary combustion

(boilers, generators and ovens), mobile combustion (transport of raw materials and equipment), and effluents. Scope 2 mainly covers the purchase of electricity.

Klabin S.A. reduced its GHG emissions by 14.3% per ton of paper, pulp and packaging, leaving 10.7% to go to reach its target of 25% reduction by 2025. Some actions carried out include maintaining two research specialists focused on analyzing climate change that may influence forest planning; operating 32 meteorological and climate monitoring stations in its areas of operation; and using the “Salvador” device (since 2019) in trucks, which helps reduce diesel consumption and consequently emissions (KLABIN, 2023).

Suzano has already achieved just over half of its target. There has not been great progress yet mainly because emissions have increased because of higher production, due to the expansion of forest operations and problems with boilers (SUZANO, 2023).

At Dexco, in 2021, absolute GHG emissions increased by approximately 32% compared to the previous year, mainly due to the acquisition of new businesses (such as LD Celulose) and higher production in some units. However, in 2022 emissions fell by 44%, mainly due to lower demand, projects to reduce energy consumption at factories, operational improvements and the shutdown of less efficient production lines (DEXCO, 2023).

BRF has committed to “being Net Zero in greenhouse gas emissions by 2040”. The Net Zero commitment means eliminating net greenhouse gas emissions into the atmosphere. So far, the company has reduced total absolute emissions in Scopes 1 and 2 by 21% compared to the base year (2019), mainly by prioritizing renewable sources with proven traceability. Over the period analyzed, there was no significant reduction in GHG emissions in Scope 3, due to the resumption of corporate travel after the Covid-19 pandemic and an increase in waste sent for composting (BRF, 2023).

Marfrig achieved a 30% reduction in GHG emissions in Scopes 1 and 2 in 2022, and, regarding the Scope 3 target of a 33% reduction, the company has already reached 13.3%. These positive results are mainly since the feedlot in Tangará da Serra (Mato Grosso) started using the product SilvAir in cattle feed. This product stimulates a natural process in the rumen that produces ammonia instead of methane (the main greenhouse gas from livestock caused by enteric fermentation). The company has also developed integrated crop-livestock-forestry systems, improved genetics for early slaughter, proper pasture management and appropriate waste disposal (MARFRIG, 2023).

At Minerva Foods, most emissions are linked to wastewater treatment plants (WWTPs) because of the fuels used. However, the company is investing in projects to modernize effluent treatment in order to reduce emissions. The increase in Scope 1 emissions also occurred due to the inclusion of feedlots and live cattle export operations in Brazil in the inventory (MINERVA, 2023).

Carbon dioxide capture

An example of forest emissions is those from fires in forest areas. Forest removals, on the other hand, represent carbon removed from the atmosphere mainly through photosynthesis.

Due to a 15% increase in Klabin’s forest base in 2022, there was a significant increase both in the volume of carbon captured by planted forests and in the volume stored in conserved native forests. Thus, 30,053,940 million tCO₂e remain to be captured to reach the 2030 target (KLABIN, 2023).

At Suzano, the result of +2,084,729 tons of emissions in 2022 was added to the removal results for 2020 and 2021 of -15,200,312 tCO₂e and -8,896,258 tCO₂e, respectively, resulting in a cumulative -22,011,839 tCO₂e of removals. This represents 55% of the target of removing 40 million tons of CO₂ equivalent by 2025 (SUZANO, 2023).

Dexco’s target is to maintain a positive carbon balance, that is, removals exceeding emissions by 2030, and this was achieved throughout the period analyzed. This was mainly due to energy matrix management, the search for other renewable fuels, improvements in production processes and the adoption of best practices in forest management and productivity (DEXCO, 2023).

There is no sufficient information on carbon capture or target indicators related to this issue for the livestock-related companies.

Energy

Klabin strives to increase the use of renewable energy generated from biomass and black liquor. Biomass is made up of bark and waste from the wood chipping process, and black liquor is a residue from wood after pulp separation. In 2022, thanks to the replacement of fuel oil in lime kilns at two units, the company reached 90.9% of its energy matrix from renewable sources, leaving just 9.1% to reach its 2030 target (KLABIN, 2023).

To manage energy, Suzano also maintains an energy matrix supported mainly by renewable sources and exports the surplus to the National Interconnected System (SIN), which is the coordination and control system formed by electricity companies from all Brazilian regions. This export contributes to meeting the country's energy demand and to the renewable share of the energy matrix, which is the ratio between renewable and non-renewable sources. Suzano's energy-related target is the amount of renewable energy exported to the SIN. In 2022, 88.14% of its energy matrix came from renewable sources. However, the company has not yet reached the 100% target, mainly because electricity consumption from the external grid rose by 1.65% because of increased production at plants that do not generate their own energy (SUZANO, 2023).

At Dexco, the target of keeping the share of renewable sources in the energy matrix above 50% was achieved throughout the period from 2020 to 2022, mainly due to the use of coal, the shutdown of less efficient lines and adjustments to furnace temperatures (DEXCO, 2023).

BRF has 90% of its energy matrix from renewable sources. The largest share comes from biomass from its own reforested areas, used to generate steam in production processes (BRF, 2023).

In 2020, renewable energy sources accounted for 15.2% of Marfrig's total consumption, increasing to 22% in 2021. The main measures adopted were training, the adoption of high-efficiency energy equipment in operations, and the use of a wind farm at its unit in Tacuarembó, Uruguay, which supplies on average 30% of the plant's energy demand (MARFRIG, 2023).

Minerva has a fully renewable energy matrix to supply its units. In Brazil, all energy comes from Minerva Biodiesel, which generates energy from beef tallow and has the Renewable Energy Seal (I-REC), which certifies that all operations consume sustainable renewable energy. The units in Bucaramanga (Colombia) and Colac and Sunshine (Australia) have solar panels to generate electricity and are a benchmark in energy efficiency within the company (MINERVA, 2023).

Water

At Klabin, 2% remains to be achieved to reach the target of a 20% reduction in specific industrial water consumption by 2030. Some actions taken to reach this target include treating 100% of industrial effluents at wastewater treatment plants before returning them to water bodies, and using the Hydrosolidary Forest Management methodology, which balances forest production and water consumption. In 2022, the company had reduced water intake by 13% since 2018, reaching 87% of its water reduction target (KLABIN, 2023).

At Dexco, water intake increased by 20% from 2020 to 2021; however, in 2022 the company managed to reduce intake by 5% through measures such as effluent reuse and use of rainwater (DEXCO, 2023).

Through actions such as reducing consumption, reuse and treatment, BRF has already reached 4.29% of its target of a 13% reduction in water consumption (m³/t) by 2025. Of all the water taken in 2022, 46,116.23 ML, or 83%, was returned properly treated. In Brazil, the company reduced water consumption in poultry carcass washing cabins by 50% through the installation of a new technology (BRF, 2023).

At Marfrig, water consumption increased in 2020 and 2021 in both North and South America due to higher production volumes. In 2022, water intake was 5.48% higher than in 2021, reaching 27.3 million cubic meters. However, the company continues to implement measures to reduce water consumption, such as adopting devices to reduce water flow, automating processes, training employees and installing wastewater treatment plants (MARFRIG, 2023).

At Minerva, there was a considerable increase in water consumption, which meant the target was not met during the analyzed period, mainly due to slaughter and evisceration processes, which account for 60% of total water consumption. However, the company is still striving to reduce consumption through actions such as monitoring, installation of new equipment, use of pressure reducers on cleaning hoses, reuse of water for truck washing, garden irrigation, and cleaning of floors and pens, in addition to wastewater treatment plants (MINERVA, 2023).

Waste

Klabin's Sustainability Policy includes a target of zero disposal of industrial waste in landfills. Just 1.5% remains to be achieved for the 2030 target, mainly thanks to waste reuse in construction (pavers, pipes, hexagonal paving blocks, curbs), use of biomass ash generated in boilers as a soil conditioner for forage in the municipality of Otacílio Costa, and training for employees (KLABIN, 2023).

At Suzano, all industrial units have waste management plans focused on increasing recycling and reuse. In addition to waste treatment centers, the company turns waste into fertilizers and biomass for energy generation. In 2022, it reached a reduction of 18.4 kg/t in waste sent to landfill, which represents an 84% improvement compared to the baseline (SUZANO, 2023).

Dexco surpassed its target for waste sent to landfill, reusing 91% of solid waste through composting, using biomass for energy generation, and reusing scrap sanitary ware and glaze in its processes (DEXCO, 2023).

BRF and Marfrig do not have specific targets directly related to the disposal of solid waste. However, they carry out waste management and have waste centers, selective collection programs and training. They also send residual waste to landfills for final disposal.

Minerva Foods also manages waste in a way like BRF and Marfrig. However, the volume of waste increased due to the start of reporting this indicator in most of the company and to increased waste generated at Latam units, justified by reconstruction works at plants affected by fires in 2021 (MINERVA, 2023).

Comparative analysis of organizations in the environmental dimension

Analyzing the environmental indicators, Klabin (forests) and Minerva (livestock) stood out the most in the period, as shown in Table 7.

Table 7 - Organizations that stood out the most in environmental indicators

ENVIRONMENTAL INDICATORS	FOREST-BASED ORGANIZATIONS	LIVESTOCK-RELATED ORGANIZATIONS
GHG emissions reduction	DEXCO	MARFRIG
CO ₂ capture	SUZANO	No information
Percentage of energy matrix from renewable sources	KLABIN	MINERVA
Reduction in water consumption	KLABIN	BRF
Waste reuse	KLABIN	MINERVA

Source: Prepared by the authors

Social dimension

In the social sphere, the companies implement actions aimed at their employees, communities and suppliers. The indicators are discussed and analyzed below, after being shown in Tables 8 and 9.

Table 8 - Social indicators of forest-based organizations

SOCIAL INDICATORS RELATED TO TARGETS (2020 TO 2022)	FOREST-BASED ORGANIZATIONS		
	KLABIN	SUZANO	DEXCO
Training and development (2022)	Reached 62% of direct and outsourced employees	Reached 94% of direct employees	Reached 27.4 hours per direct employee/year
Female leaders	23%	24%	30%
Employees belonging to diversity groups	87% of employees belong to diversity groups	Ensures a 94.2% inclusive environment for LGBTQIAP+ people	No information
Accident frequency rate with leave of absence	2020: 2.18 2021: 1.70 2022: 1.35	2020: 0.52 2021: 0.51 2022: 0.37	2020: 1.81 2021: 1.45 2022: 4.03
Community-related indicators	76% of priority municipalities with public management support actions (target: 100% by 2030)	29,633 people lifted out of poverty (target: 200,000)	Donations
Number of suppliers assessed on social and environmental criteria	70% of critical suppliers approved	100% of wood suppliers approved	Average supplier performance score of 7.29 (target: 8)

Source: Prepared by the authors.

Table 9 - Social indicators of livestock-related organizations

SOCIAL INDICATORS RELATED TO TARGETS (2020 TO 2022)	LIVESTOCK-RELATED ORGANIZATIONS		
	BRF	MARFRIG	MINERVA
Training and development (2022)	29.97 hours per direct employee/year	8.04 hours per direct employee/year	25 hours per direct employee/year
Female leaders	24%	22%	25%
Employees belonging to diversity groups	In 2021, 38% of employees were black	No information	No information
Accident frequency rate with leave of absence	2020: 9.92 2021: 6.71 2022: 6.0	2020: 957 accidents 2021: 676 accidents (30% reduction) 2022: 386 accidents (43% reduction)	2020: 1.31 2021: 0.53 2022: 0.8
Community-related indicators	R\$ 78.5 million invested in communities by 2022 (target: R\$ 400 million by 2030)	Marfrig Fazer e Ser Feliz Institute and donations	“Educar para Transformar” program and donations
Number of suppliers assessed on social and environmental criteria	100% of purchases made from compliant suppliers	In Brazil, 100% of direct suppliers are free from deforestation	100% of new direct cattle suppliers in compliance

Source: Prepared by the authors

The social sustainability indicators show the effectiveness of the companies’ social initiatives. Internally, the focus is on practices aimed at employees seeking satisfaction and development in inclusive and sustainable work environments. Externally, the actions focus on local communities and society.

Below are explanations of each social indicator selected for the analysis.

Training and development

Through the “Klabin Business School”, the company seeks to significantly improve employee skills. Of its 25,000 employees (direct and outsourced), 15,500 were trained in 2022, showing marked progress. Suzano reached 94% of employees trained in 2022 through its UniverSuzano platform. Dexco invests in training and development through its UniDexco platform and showed significant progress over the period.

Although BRF and Minerva do not have specific targets for training, they maintained a substantial level of capacity building. Marfrig's target is to reach at least 40 hours of training per year per unit; however, the average hours per employee are still relatively low.

Diversity and inclusion

Klabin implements several actions to promote gender equality and respect for LGBTQIA+ people. The company is close to reaching its targets, with only 6.56% remaining to reach the target for female leaders and 3% for employees belonging to diversity groups. Main initiatives include linking part of directors' and managers' variable pay to diversity indicators; holding an annual Diversity Week; and hiring and developing minority groups (KLABIN, 2023).

Suzano states that an inclusive work environment is one in which all people feel welcomed, respected and safe to be who they really are, regardless of individual characteristics. Regarding its target of 100% inclusive environment for LGBTQIA+ people, the company reached 92.4% in 2022. For women in leadership positions, it reached 23.60%, up from 15.8% in 2019, with a target of 30% by 2025 (SUZANO, 2023).

At Dexco, no structured targets were observed for diversity and inclusion. However, the company invests in actions such as awareness-raising on gender, disability, race, ethnicity and LGBTQIA+ issues; awareness campaigns; panels; and discussion groups. Dexco has a more ambitious target for women in leadership positions: 35% by 2025, with 30% already achieved in 2022 (DEXCO, 2023).

BRF participates in the Racial Equity Program (MOVER), which brings together around 47 organizations in Brazil to combat racism and promote racial equality, and they have set a target of having black employees in 10,000 leadership positions by 2030. The company reported that 38% of its workforce were black in 2021. It also declared having around 5,000 foreign and refugee employees in 2022. However, there are no declared LGBTQIA+ employees, nor is there a target for this indicator (BRF, 2023).

Marfrig and Minerva do not have established targets for diversity, nor have they published sufficient information on the topic during the period analyzed.

Health and safety

All the companies analyzed base their Occupational Health and Safety Management Systems on ISO 45001 and ISO 9000 and on Brazilian regulatory workplace standards.

Klabin has the "Viver Bem" program, which offers various actions for physical and mental health, access to free online psychotherapy and training. Its main target is to keep the accident frequency rate with leave of absence (direct and outsourced employees) below 1. There was a significant reduction in this rate, with 0.35 still to be reduced by 2030 (KLABIN, 2023).

Suzano's target is to reach an accident frequency rate of 0.42. In 2022, it reached an excellent result of 0.37, thanks to actions including meetings on occupational safety, enforcement of personal protective equipment use, recording unsafe behaviors, inspections, training and indicator management (SUZANO, 2023).

At Dexco, the culture of health and safety still needs to mature. The frequency rate of accidents with leave of absence increased in both Brazil and Colombia, and the indicator was far from the target in 2022. In this context, the company invested in actions such as stricter control measures, investments in machine and equipment upgrades, audits and safety inspections (DEXCO, 2023).

BRF also follows all legal requirements and maintains routines and tools that enable continuous monitoring of indicators. There was a significant decrease in the frequency rate of accidents with leave of absence, and one of the main actions that supported this improvement was a fatigue control system for drivers installed in 100% of the outsourced transport fleet (BRF, 2023).

At Marfrig, the number of accidents with and without leave of absence fell significantly compared to 2020, with reductions of 43% and 38%, respectively, in 2021 and 2022, as the company has consolidated processes to assess risks, danger and to investigate accidents and incidents (MARFRIG, 2023).

Minerva did not disclose enough information on health and safety and has no defined target for this topic. However, there was a significant reduction in accidents with leave of absence during the period analyzed (MINERVA, 2023).

Community-related indicators

Klabin's main community program is the Public Management Support Program, through which the company provides specialized consulting services for planning and drafting multi-year plans (PPAs) for priority municipalities (Telêmaco Borba, Ortigueira, Imbaú, Ventania, Tibagi, Otacílio Costa, Correia Pinto, Lages, Goiana, Angatuba and Rio Negro), defining more than 2,140 actions in total and helping to reduce public spending (KLABIN, 2023).

Suzano has community programs such as the Cerrado Project and the Colmeia Project, which support the sustainable extraction of non-timber forest products, such as fruits and seeds; strengthen waste picker associations; and promote training for women and young people. Through these actions, the company has reached 14.8% of its target of lifting 200,000 people out of poverty by 2030 (SUZANO, 2023).

In 2022, Dexco reported that it was still developing indicators and targets related to its newly established Social Responsibility Guidelines. However, it holds dialogues with communities affected by negative environmental impacts, promotes campaigns and school activities, and makes donations and investments in social projects (DEXCO, 2023).

BRF's target is to invest R\$ 400 million in communities by 2030. To achieve this, the company has created programs such as "Alimento que Transforma" and "Educação para o Futuro". These actions are led by the BRF Institute, a private association that manages the company's social investments. In addition, all units have formal processes for receiving complaints from local communities (BRF, 2023).

The Marfrig Fazer e Ser Feliz Institute is managed by Marfrig and serves children aged 6 to 11 in situations of social vulnerability with sports and leisure activities. In addition to the institute, the company makes donations, mainly to healthcare organizations such as Hospital do Amor (Barretos – SP) and the Hospital Boas São João XXIII (Amazonas) (MARFRIG, 2023).

Minerva's social actions also focus on donations, mainly of meat to hospitals and charitable institutions, both in Brazil and in its units in Argentina and Uruguay. However, the company still does not have defined indicators for this topic (MINERVA, 2023).

Suppliers

The companies analyzed have Supplier Management Programs that include social and environmental assessments in order to ensure that suppliers follow good social and environmental practices and properly manage the risks associated with their activities.

In 2022, Klabin reached 70% of its target of having 100% of its critical suppliers approved in social and environmental assessments. The criteria for defining a supplier as critical include the value of revenues from Klabin, its importance to the business and purchases made more than six times (KLABIN, 2023).

Suzano reached 100% of its target in 2022, that is, all the company's wood suppliers were approved in social and environmental assessments (SUZANO, 2023).

BRF has a comprehensive and complex supplier management program, including initiatives such as the Supply Chain Monitoring Program, which covers the entire chain from grain purchasing to freight and logistics services. All new partners are selected based on social and environmental criteria (BRF, 2023).

Marfrig's target is to have 100% of its supply chain free from deforestation. In Brazil, 100% of direct suppliers are monitored by satellite and in real time and are therefore deforestation-free. To achieve this excellent result, the company relies on the "Marfrig Verde+" program, which reintegrates producers who were blocked for not complying with socio-environmental criteria, making it possible for them to again meet the company's sustainability requirements (MARFRIG, 2023).

Minerva does not have a defined target for suppliers, but it has reached high standards such as: 100% of new direct cattle suppliers in Brazil and Paraguay selected based on social and environmental criteria; and monitoring of 100% of direct farms, ensuring zero illegal deforestation and protection against invasion of Indigenous lands (MINERVA, 2023).

Comparative analysis of organizations in the social dimension

Among the forest-based organizations, only Klabin and Suzano have defined targets for the diversity and inclusion indicator; Dexco does not. Among livestock-related organizations, only BRF discloses its percentage of black employees, and the others disclose little or no information on this indicator.

The forest-based organization that stands out most for its low accident frequency rate is Suzano, thanks to its digital health and safety platform, which helps identify and map risks. Among livestock-related companies, Minerva has a low accident frequency rate but discloses little information on the topic in its reports.

Thus, analyzing the social indicators, it is only possible to clearly state that the companies Dexco and Minerva stood out for the indicator “Female leaders”. For the other indicators, it is not possible to identify which companies stood out most, due to the lack of defined targets or because the information is published in non-comparable formats. See Table 10.

Table 10 - Organizations that stood out the most in social indicators

Social indicators	Forest-based organizations	Livestock-related organizations
Female leaders	DEXCO	MINERVA
Accident frequency rate with leave of absence	SUZANO	Marfrig does not report a rate and Minerva has a low rate
Training and development	All improved their training indicators over the period	
Employees belonging to diversity groups	Little information disclosed by the organizations	
Community-related indicators	All have social initiatives with good results	
Suppliers assessed on social and environmental criteria	All carry out social and environmental assessments of suppliers	

Source: Prepared by the authors

Corporate governance dimension

In the sustainability reports, one of the most important corporate governance practices highlighted by the companies is risk management, which operates in three main areas: integrated risk management, compliance and whistleblowing channels.

Integrated risk management seeks to map, classify and monitor risks associated with the business, such as risks of losses, financial and operational risks (failures, weaknesses), and compliance risks (failures to comply with laws, agreements, regulations and others). The Compliance Program includes the Anti-Corruption Policy, which defines guidelines and criteria to fight deviations, fraud, irregularities and harmful acts against both the public administration and the private sector, and covers topics such as gifts, hospitality and entertainment, donations, relations with public agents and others.

The governance indicators therefore cover actions aimed at demonstrating the organization’s ethics and transparency and focus on the company’s management structures. As shown in Tables 11 and 12, the analysis considered practices related to internal policies aligned with compliance, anti-corruption practices and actions to avoid unethical practices and conflicts of interest.

Table 11 - Corporate governance indicators of forest-based organizations

CORPORATE GOVERNANCE INDICATORS RELATED TO TARGETS (2020 TO 2022)	FOREST-BASED ORGANIZATIONS		
	KLABIN	SUZANO	DEXCO
Cases received and resolved by the whistleblowing channel	Cases investigated in 2021 and 2022: 804. Cases classified as complaints in 2021 and 2022: 126	Cases received: 3,335. Cases resolved: 3,117	Cases received: 1,184. Cases classified as complaints: 217. Complaints resolved: 206
Confirmed cases of corruption and/or misconduct	No corruption cases reported via the whistleblowing channel	2020: 15 cases 2021: 15 cases 2022: 17 cases	No corruption cases reported and no ongoing or completed investigations

Source: Prepared by the authors

Table 12 - Corporate governance indicators of livestock-related organizations

CORPORATE GOVERNANCE INDICATORS RELATED TO TARGETS (2020 TO 2022)	LIVESTOCK-RELATED ORGANIZATIONS		
	BRF	MARFRIG	MINERVA
Cases received and resolved by the whistleblowing channel	Complaints received: 9,146. Complaints handled: 8,685	Cases received in 2021 and 2022: 882. No data on resolved cases	Cases received in the period: 628. No data on resolved cases
Confirmed cases of corruption and/or misconduct	No confirmed corruption cases in the period	No confirmed corruption cases in the period	No confirmed corruption cases in the period

Source: Prepared by the authors

Comparative analysis of organizations in the corporate governance dimension

All organizations have integrated risk management programs that include Anti-Bribery and Anti-Corruption Policies and Disciplinary Measures Policies, as well as whistleblowing channels or ombudsman services. They resolve more than 90% of the cases reported.

Among forest-based organizations, Dexco discloses the most detailed information on the indicator “Cases received and resolved by the whistleblowing channel”. Regarding the anti-corruption indicator, Suzano reports 15 corruption cases in 2020, 15 in 2021 and 17 in 2022. However, the company did not record any cases of corruption involving public authorities; all complaints refer to private corruption, involving issues such as misappropriation, conflict of interest, manipulation of information, bribery and information leaks. Among livestock-related organizations, Marfrig and Minerva did not publish enough information on complaints and only state that there were no confirmed corruption cases during the period.

Therefore, it is not possible to identify which organizations stood out the most in governance indicators, either due to the lack of comparable criteria for this topic or the lack of reported data.

CONCLUSION

This study aimed to analyze the environmental, social and governance sustainability actions adopted by Brazilian organizations downstream in the agricultural production chain that work with raw materials from agriculture and forestry and are listed in the ISE B3, for the period from 2020 to 2022.

After analyzing the reports, it was found that progress in ESG matters generates significant benefits for society and the environment. Furthermore, ESG has become increasingly important in today’s corporate world, and the trend is for its relevance to continue to grow.

Based on the indicators presented, the following conclusions can be drawn.

Klabin and Suzano show good progress in meeting their ESG targets, maintaining important practices such as reducing water intake, GHG emissions and solid waste sent to landfills, as well as improvements in social and governance indicators. At Dexco, there is still a lack of defined targets for social indicators and a lack of ambition regarding environmental indicators. The livestock-related organizations show good results in ESG, especially in supplier management and combating illegal deforestation. However, they still need to improve the level of detail of indicators, especially social and governance indicators, and to define targets for several environmental indicators, such as solid waste, and for most social indicators.

In general, the organizations studied seek not only financial development, but also environmental preservation, improved quality of life for communities, and the reduction of inequality and violence.

Thus, based on these reflections, it can be inferred that this study achieved its objective of discussing the ESG practices of organizations linked to agriculture and forestry and presenting comparative analyses, highlighting their actions in the three pillars of sustainability and identifying their benefits.

It is also inferred that this study has some limitations, as it focuses only on organizations linked to agriculture and forestry that are listed in the ISE B3, and does not take into account that ESG criteria may vary according to the nature of each business and the costs associated with sustainability management in each production and sales model.

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