

Sustainable Development Goals (SDGs) in Biotechnology Companies: An Assessment of the Sustainability Reports

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Abstract. This paper investigates the portrayal and execution of Sustainable Development Goals (SDGs) within the biotechnology sector through an analysis of Global Reporting Initiative (GRI) sustainability reports. It explores how biotechnology companies prioritize and invest in SDGs before and after the COVID-19 pandemic, evaluating a sample of reports from the 100 leading publicly traded biotech firms. The findings indicate a widespread use of materiality matrix approaches and frequent mentions of the SDGs in the reports, but limited alignment with standardized identification methods, signaling a lack of transparent reporting structures. Specifically, a meager focus on SDG-related initiatives during the pandemic is evident, with only 26% of reports addressing this crucial aspect. Despite a gradual increase, a substantial gap remains in these reports, emphasizing the necessity for more comprehensive and structured SDG reporting strategies in the biotech industry. This study contributes to understanding and enhancing SDG reporting practices in the sector, aiming to better align these companies with global sustainability goals.

Keywords: Causal loop diagram, food bank, supply chain, sustainable development goals, SDG 2, food security.

1. Introduction

Sustainability is a subject incorporated in most governments and companies' agendas, as well as in the news and even during casual talks. However, its real meaning and applicability to the society, the economy or into the environment itself is not very well known (Zago et al., 2021). One proposed practice to monitor industrial performance is sustainability indicators, commonly divided into three dimensions: environmental, social, and economic (Valente et al., 2018). According to Abshagen, Cavazzini, Graen and Obenland (2018), since 2008, the UN Global Compact has hosted annual UN Private Sector Forum summits to facilitate dialogue between governments and businesses. Since the SDGs' adoption in 2015, the focus has been on multinational companies' obligations, especially in pilot projects, gender quotas, and sustainable infrastructure investments.

In the United Nations' Global Compact (2015), 193 member states committed to devising a plan for a better future for the planet. Consequently, in 2015, they established the "Agenda 2030" and outlined 17 Sustainable Development Goals (SDGs). In alignment with the United Nations Global Compact (2015), these goals define the world we aspire to, encompassing aims like eradicating poverty, ensuring quality education, and eliminating hunger. Private companies and governments must engage in this process, given that these objectives involve both sectors, aiming to realize the outlined plans by 2030.

By Lalaguna and Dorodnykh (2018), it becomes evident that the delay in integrating environmental and social aspects with the economic dimension of sustainability within private sector endeavors can result in the accumulation of adverse effects on both human health and the environment. Acknowledging the significance of the private sector, Agenda 2030 recognizes it as a pivotal stakeholder in fostering sustainable development. Hence, the private sector ought to play a significant role in promoting sustainability, focusing not only on economic advancement but also taking into account social and environmental concerns and necessities (Sullivan, Thomas & Rosano, 2017).

According to The International Council of Biotechnology Associations (2020), biotechnology offers solutions for sustainable development. With the advancement of biotechnology, various aspects can be improved, such as curing diseases once deemed incurable, enabling rapid responses to health crises, enhancing plant health which, in turn, bolsters food security, reducing greenhouse gasses, and more.

Considering the pivotal role of biotechnology companies in sustainable development and the significance of implementing SDGs to achieve the desired outcomes by 2030, this paper aims to conduct a meticulous analysis of how SDGs are being presented and implemented in biotechnology firms.

This paper intends to address the following research questions: (Q1) How do biotechnology companies prioritize the SDGs and which align better with their organizational objectives? (Q2) Are there differences in investments made by companies in SDG implementation before and after the pandemic, considering internal targets and challenges?

Based on these inquiries, this paper aims to identify the most effective methods that biotechnology companies use to determine which SDGs to prioritize and integrate into their organizational strategies. This involves analyzing the methodologies reported in their sustainability reports and assessing their alignment with the Global Reporting Initiative (GRI) guidelines.

The research methodology will elucidate the procedural intricacies involved in conducting this study, delineating the process of collecting and analyzing public reports from biotechnology companies. Additionally, it will outline the framework employed to assess the incorporation of Sustainable Development Goals (SDGs) within these reports.

2. Literature Review

2.1. Reporting on Relevant SDGs

According to ASE BIO (2020), the biotechnology sector plays a pivotal role in advancing international development, contributing directly to multiple Sustainable Development Goals (SDGs) outlined in the 2030 agenda. Biotechnological innovations have the potential to address a wide range of critical global challenges. According to the International Council of Biotechnology Associations (ICBA), these breakthroughs encompass curing once-incurable diseases, responding rapidly to health crises,

improving plant health for enhanced food security, promoting animal health, combating antimicrobial resistance, reducing greenhouse gas emissions, and developing food solutions fortified with micronutrients to help combat hunger

(ICBA, 2020). The Asociación Española de Bioempresas (ASE BIO) emphasizes that biotechnology fosters sustainable economic growth and social well-being through significant investments in research and development (ASE BIO, 2020). This aligns with the notion proposed by Hajer et al. (2015) which highlights the importance of innovative companies harnessing their creative abilities and technological resources to tackle sustainable development challenges.

Biotechnology, like other sectors, may have variable impacts on different SDGs, necessitating a strategic approach to prioritize specific goals. As per Lokko et al. (2018), the utilization of biotechnology resonates with the collective commitment to achieving SDGs, notably Goal 2 by addressing hunger and food security, Goal 3 by enhancing universal well being, Goal 9 through sustainable industrialization and innovation, and Goal 12 by promoting sustainable consumption and production practices. In line with the concept of creating shared value, addressing sustainable development challenges effectively involves identifying social and environmental issues that hold significance for both the company and its stakeholders (Calabrese et al., 2019b; Muñoz-Torres et al., 2013). This recognition and engagement are fundamental, as organizations need to transparently address material sustainability issues with substantial impacts on their operations and stakeholders. Prioritizing and reporting on these material sustainability issues is crucial to demonstrate the industry's commitment to addressing its most pressing challenges, a critical aspect for biotech companies (Accountability, 2018).

To address these issues, companies should conduct a materiality analysis, as recommended by GRI guidelines, which helps identify, prioritize, and review sustainability issues for inclusion in their reports (GRI, 2016). This analysis considers the materiality of issues from two angles: their impact on the organization's ability to achieve its goals and the expectations of stakeholders regarding how the organization responds to these issues (GRI, 2016, P. 36). Additionally, the GRI guidelines suggest using a "materiality matrix" to prioritize sustainability aspects based on their significance to stakeholders and their economic, environmental, and social impacts (GRI, 2015). This matrix aids in identifying issues that are both central to a company's strategic priorities and highly relevant to stakeholders. Furthermore, GRI has developed specific guidelines to support companies in effectively reporting their contributions to SDGs. The guidance, such as the "SDGs Compass Guide" and "Integrating the SDGs into corporate reporting," emphasizes a phased approach that involves understanding, integrating, and monitoring SDGs in corporate strategies to ensure ongoing improvement (GRI, 2018). Prioritizing SDGs is crucial to prevent a selective approach and encourages companies to contribute to goals that align with their significant impacts and stakeholder interests, rather than just the easiest to achieve.

Costa's (Costa et al., 2022) findings highlight the substantial relevance of Sustainable Development Goals (SDGs) for businesses. Companies have a vital role to

play in contributing to these goals by aligning sustainability challenges with business opportunities from a shared value perspective. Corporate sustainability reporting serves as a powerful tool for assessing the importance of SDGs for businesses and understanding their active contributions. While Costa's study focused on the tourism sector, the analysis indicated a growing adoption of the materiality matrix approach to communicate relevant sustainability measures and actions, along with a significant mention of SDGs in sustainability reports. Nonetheless, there is room for enhanced transparency, especially in illustrating how companies align their operations with SDGs and address material sustainability issues. Future research can delve deeper into these connections and offer practical approaches for comprehensive reporting, particularly relevant for small and medium-sized enterprises (SMEs).

2.2 Challenges of the SDG Adoption and Reporting in the Biotechnology Sector

One of the ways to quantify and qualify the sustainability of a company is through sustainability reports, which present information such as sustainability indicators (SI), parameters that allow measuring the performance of the organization on a given occasion (Valente et al., 2021). The biotechnology sector is on a trajectory for substantial growth, with a projected market value of \$2.44 trillion by 2028. This impressive expansion, as reported by Grand View Research (Bloomberg, 2021), is fueled by factors like favorable government policies, continuous innovation, substantial investments, and a growing demand for synthetic biology. Notably, the COVID-19 pandemic significantly influenced the health application segment, emphasizing the adaptability and responsiveness of biotech. Furthermore, as Shankar (Shankar, 2016) highlighted, the environmental benefits of biotechnology are promising, ranging from enhancing soil fertility for sustainable agriculture to addressing agro-ecosystem and environmental challenges. For instance, it plays a vital role in carbon sequestration, eco-friendly biofuel production, and remediating contaminated water sources. The sector's focus is also transitioning towards sustainability, with the development of bioplastics from renewable sources, thereby reducing reliance on fossil-based materials, as exemplified by Lambert and Wagner's research (Lambert and Wagner, 2017). Biotechnology extends its impact to other sectors by addressing supply risks of critical raw materials in Europe, as discussed by Hennebel et al. (2015) its contributions range from sustainable primary mining to urban mining and substituting critical metals.

Furthermore, the experience of rapidly developing and deploying COVID-19 vaccines underscores the biotechnology sector's potential in addressing global challenges, revolutionizing industries from healthcare to agriculture. This success reveals the role of innovation and advanced techniques in expediting scientific progress, emphasizing the need for continuous research and innovation to tackle global challenges effectively, as mentioned by Ball (Ball, 2020). Sutherland et al.'s study (2021) highlights the biotechnology sector's vast potential to positively impact global sustainability challenges and advance the United Nations' Sustainable Development Goals (SDGs), particularly through the use of microalgae.

Biotechnology can address issues related to aquatic pollution, sustainable nutrition and food sources, water purification and sanitation, clean energy, responsible consumption and production, marine ecosystem preservation, and sustainable land-based practices.

Moreover, Adenle and Ramos (2015) emphasize that biotechnology, especially through genetically modified organisms (GMOs), possesses significant potential to foster sustainable growth, alleviate poverty, and contribute to environmental conservation in developing countries. Despite concerns about GMOs' safety, 15 years of risk assessment has not identified substantial negative impacts on human health or the environment. Instead, GMOs offer socio-economic and environmental benefits that can lead to greater food security and economic progress, addressing pressing issues, as Adenle highlights (2020).

Additionally, biotechnology's transition towards sustainable models, as discussed in Ramos' study (2023), can significantly benefit food production, reduce hunger, and promote global sustainability goals. Innovations like precision agriculture, genetically engineered crops, and bioinoculants can boost yields, while eco-friendly fertilizers and microbiome-based solutions help reduce pollution and enhance soil health. Furthermore, plant-microbe interactions, such as growth-promoting microbes, contribute to crop health and reduce greenhouse gas emissions, aligning with the UN's Sustainable Development Goals. It is critical to recognize that biotechnology companies, as detailed by Adenle et al., (2020) face complex challenges when selecting and prioritizing SDGs due to their diverse activities, regulatory discrepancies, regional opposition to GMOs, and the intricate interplay between the SDGs. However, stakeholders can play a pivotal role in identifying and prioritizing environmental, social, and economic issues for these companies.

By involving a wide range of stakeholders, biotech firms can focus on sustainability challenges, align their efforts with the SDGs, build trust, and create shared value, as emphasized by various experts. Moreover, the sector is witnessing increasing demands for transparency and accountability, with sustainability reporting being instrumental in monitoring engagement with SDGs. This reporting not only provides insights into a company's social and environmental performance but also demonstrates its commitment to sustainable practices, ensuring that companies can be held accountable, attract ethical investment, and play a central role in advancing global sustainability.

3. Methodology

Considering the research questions to be answered, they would be as follows: (Q1) How do biotechnology companies prioritize the SDGs, and which align better with their organizational objectives? (Q2) Are there differences in investments made by companies in SDG implementation before and after the pandemic, considering internal targets and challenges?

The methodology was structured based on two previous studies, Costa, Menichini, and Salierno (2022) and Campos (2004). The methodology is divided into two parts. The first part outlines how the search for biotechnology companies' SDG reports will be conducted, and the second part explains how the analysis will be carried out using a table format.

The biotechnological companies that are listed on the stock exchange market with publicly available reports, accessible online via websites, were selected. These reports needed to cover both pre-pandemic and post-pandemic periods, allowing for an answer to the second research question.

In the study by Costa, Menichini, and Salierno (2022), the first work used to develop the research methodology, three variables were evaluated. To effectively address the second research question, an additional evaluative criterion was incorporated. Figure 1 outlines the step by-step process for searching and analyzing content in biotechnology companies' public documents. This process was adapted from Campos' (2004) work, which illustrates the phases of content analysis.



Flowchart of search and analysis process **Figure 1**

The research process consists of:

i. Pre-exploration of interview materials: Researchers conduct initial readings to grasp the content globally, allowing the assimilation of material without structured commitments. This approach facilitates identifying subtle insights. Researchers will assess selected reports for relevance in the fourth stage.

ii. Selection of analysis units: In qualitative research, selecting units such as words or phrases is crucial, guided by research questions. Thematic analysis, focusing on specific themes, is common but influenced by research objectives, adopted theories, and researcher intuition. The authors will evaluate the material to decide whether to proceed with the report.

iii. Categorization and subcategorization involve classifying data elements like words or phrases for subsequent analysis. Categories, themed in nature, may be predefined or emerge from participants' responses, relating to Table 1.

They structured three evaluative variables: Relevant sustainability issues, Citing SDGs, and Standardized identification of relevant SDGs. In this article, an additional category is introduced: improvement in document quality and SDG implementation within companies. The evaluation of reports is outlined in Table 1.

The research focused on companies listed among the top 100 in terms of market capitalization on the stock exchange, encompassing small, medium, and large enterprises. This selection was grounded in the belief that publicly listed companies offer readily accessible data, thereby bolstering the study. The diverse selection aimed to analyze the published content using the method elucidated in this section

Table 1. Coding agenda

Search Questions	Description	Coding Rules
(SQ1) Relevant sustainability issues	Explanation of the relevant measures and actions “that can reasonably be considered important for reflecting the organization’s economic, environmental, and social impacts, or influencing the decisions of stakeholders” (GRI, 2016)	When the report discloses the materiality matrix, it is encoded as ‘Yes’ (‘No’, otherwise).
(SQ2) Citing SDGs	Explicit reference to the SDGs in the report	When the report mentions the Sustainable Development Goals (SDGs), it is encoded as ‘Yes’ (‘No’, otherwise).
(SQ3) Standardized identification of relevant SDGs	Standardized identification of relevant SDGs	When the report discloses a relevant set of SDGs, in line with the reporting procedures suggested by the GRI2, it is encoded as ‘Yes’ (‘No’, otherwise).

<p>(SQ4) Analyze if there is a difference in investments made in SDGs post pandemic</p>	<p>Check for explicit references in public reports regarding SDG-related actions after the COVID-19 pandemic</p>	<p>If there are investments regarding Covid-19 and SDGs-related, it is encoded as 'Yes'; otherwise, it is encoded as 'No'.</p>
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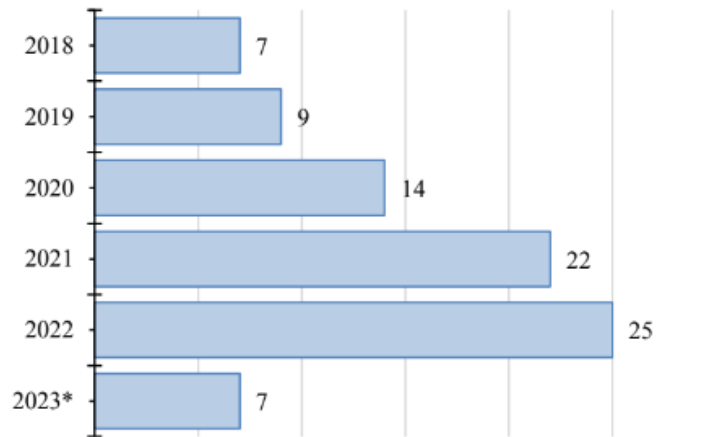
Therefore, by employing the process outlined in Figure 1 and the coding system provided in Table 1, it will be possible to standardize and analyze all the reports identified by the researchers. After surveying the public reports of the companies, strings were used to analyze whether the reports could answer the questions in Table 1, these strings were: SQ1 – Materiality Matrix, SQ2 – SDG, SQ3 – GRI, and SQ4 – COVID. The findings will be presented in the following section.

4. Discussionas and Results

This section describes the results obtained from the application of the methodology outlined in the previous section. As mentioned during the methodology, a survey was conducted on the top 100 biotechnology companies listed on the stock exchange. After identifying these companies, website research was conducted to verify whether they had reports showcasing ESG practices throughout the years (From 2018 to 2023). Out of the 100 companies surveyed, only 33 companies had public reports, and out of that, 9 companies had public reports before the COVID-19 pandemic and after. Thus, answers regarding the fourth topic in Table 1 have already been obtained.

In total 84 public sustainability reports were gathered from 2018 until 2023 (The search was conducted in October/23 thereafter the reports published after that date were not included in this assessment). The number of sustainability reports published over the years is increasing, these results are shown in Graphic 1.

Number of Sustainability Reports Published per Year



Graphic 1 – Number of sustainability reports published per year for the Top 100 biotechnological companies in terms of market capitalization.

*2023 reports were gathered in October/23

Following the methodology proposed in the Table 1, the gathered sustainability reports were assessed, and the results were compiled in the Table 2 below:

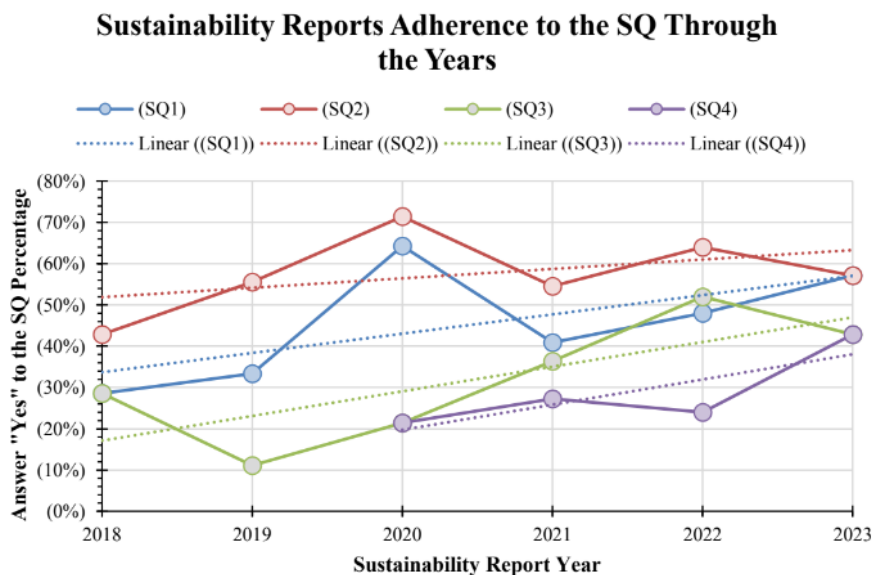
Table 2. Displays the obtained results.

SQ	(SQ1)		(SQ2)		(SQ3)		(SQ4)	
	Yes	No	Yes	No	Yes	No	Yes	No
2023	4 (57%)	3 (43%)	4 (57%)	3 (43%)	3 (43%)	4 (57%)	3 (43%)	4 (57%)
2022	1 (48%)	1 (52%)	1 (64%)	9 (36%)	1 (52%)	1 (48%)	6 (24%)	1 (76%)
2021	9 (41%)	1 (59%)	1 (55%)	1 (45%)	8 (36%)	1 (64%)	6 (27%)	1 (73%)
2020	9 (64%)	5 (36%)	1 (71%)	4 (29%)	3 (21%)	1 (79%)	3 (21%)	1 (79%)
2019	3 (33%)	6 (67%)	5 (56%)	4 (44%)	1 (11%)	8 (89%)	-	-
2018	2 (29%)	5 (71%)	3 (43%)	4 (57%)	2 (29%)	5 (71%)	-	-
Total	3 (46%)	4 (54%)	5 (60%)	3 (40%)	3 (36%)	5 (64%)	1 (26%)	5 (74%)

Concerning SQ1, 39 (46%) of the reports, present a materiality matrix approach. This approach serves to communicate significant measures and actions that are reasonably deemed important for both a company's impacts and its stakeholders. This discovery aligns with earlier research, indicating that the use of materiality analysis is widespread to concentrate management efforts on sustainability goals, enhance relationships with stakeholders, and bolster accountability (Guix et al., 2018; Moratis and Brandt, 2017). About SQ2 and SQ3, 50 reports, constituting 60% of the total, refer to Sustainable Development Goals (SDGs), whereas only 30 reports (36%) adhere to a

standardized method of identifying these SDGs. These findings uncover that while most of the chosen reports mention SDGs, approximately half of them fail to elaborate on the methodology used to pinpoint priority goals in line with the Global Reporting Initiative's guidelines (GRI 2015; GRI 2018). These results underscore the lack of transparency regarding how companies pursue SDGs, a deficiency previously noted in studies (Lopez, 2020). Moreover, when considering the publication year specifically for SQ3, it becomes apparent that the standardized approach for selecting SDGs has only been adopted in recent years. Regarding SQ4, it is alarming that only 18 reports (26%) from 2020 to 2023 directly mention SDG-related initiatives focused on the COVID-19 pandemic. This is concerning because biotechnology companies are anticipated to play a crucial role in combating pandemics, yet this expectation is not reflected in the sustainability reports of the top 100 companies by market capitalization. Furthermore, this percentage has been gradually increasing over the years, with 2023 exhibiting the highest percentage compared to other years. This upward trend indicates that despite a decline in COVID-19 cases, companies remain cognizant of potential impacts and continue to allocate investments for future preparedness.

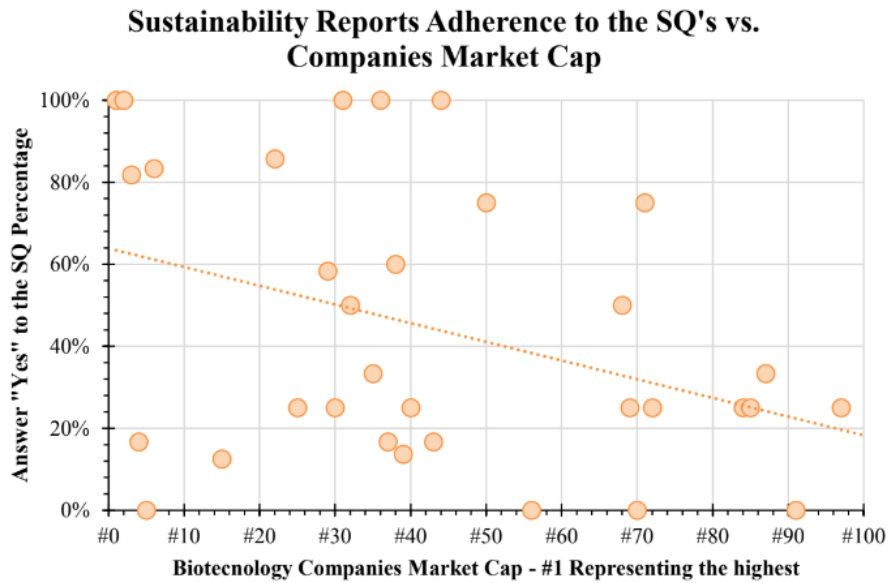
Across all SQs, a noticeable uptick in adherence to sustainability reporting was evident, supported by a positive correlation in the frequency of "Yes" responses across all questions over the years, as depicted in Graphic 2. These results indicate that although numerous companies still do not consistently report on sustainability, there's a clear improvement in the quality of reports over time. This trend signifies the advancement of sustainability-driven management practices.



Graphic 2 – Sustainability reports adherence to the search questions through the years.

Throughout all SQs, a notable yet weak correlation emerges between the frequency of "Yes" responses and the size of a company's market capitalization, as observed in Graphic 3. The pattern indicates that companies with higher market capitalization (with #1 representing the highest market cap) tend to display greater

adherence to the proposed sustainability questions. These findings are consistent with previous studies that underscore the challenges faced by smaller companies in aligning with Global Reporting Initiative (GRI) guidelines due to constraints related to resources, experience, and incentives to effectively implement sustainability measures and contribute to Sustainable Development Goals (SDGs) (Verboven and Vanherck, 2016).



Graphic 3 – Sustainability reports adherence to the search questions vs. biotechnology companies' market capitalization.

Interestingly, all companies that had an adherence higher than 80% are biopharmaceutical companies that provide drug substances for disease treatments, therapies, and vaccines.

5. Conclusion

Firms play a pivotal part in realizing the Sustainable Development Goals (SDGs). Yet securing a meaningful contribution to the SDGs necessitates aligning sustainability challenges with business opportunities through a shared value approach. The practice of corporate sustainability reporting is a potent mechanism that elucidates the significance of SDGs for businesses and delineates the methods through which companies actively contribute to these global objectives.

This study aims to investigate how biotechnology firms communicate their pertinent sustainability initiatives, shaping their contribution to the Sustainable Development Goals (SDGs). Specifically, the paper explores how these companies prioritize which SDGs better align with their organizational objectives (Q1) and assess

differences in their investments towards SDG implementation before and after the pandemic considering internal goals and challenges (Q2).

Upon reviewing the reports within the sample, a substantial embrace of the materiality matrix approach for communicating pertinent sustainability measures and actions becomes apparent, adopted by 46% of the companies. Similarly, the findings indicate that SDGs are referenced in 60% of the analyzed reports, yet half of these reports lack explicit elucidation on the methodology employed to prioritize goals in alignment with the Global Reporting Initiative's directives. These outcomes underscore the prevalent lack of transparency in SDG reporting, particularly in articulating how material sustainability issues contribute to the business's alignment with SDGs.

The study also identified a concerning trend: only 26% of reports from 2020 to 2023 addressed SDG-related initiatives in response to the COVID-19 pandemic. Given the biotechnology sector's pivotal role in pandemic response, this low percentage underscores the need for more robust and explicit reporting on such critical issues. Despite this, an upward trend in addressing pandemic-related sustainability initiatives was observed, particularly in 2023, reflecting a growing awareness and preparedness for future challenges.

Overall, the study underscores the importance of aligning business strategies with the SDGs through comprehensive and transparent sustainability reporting. Companies with higher market capitalization showed better adherence to sustainability guidelines, consistent with previous studies that highlight the challenges faced by smaller firms in this domain. Continuous improvement in the quality of sustainability reports is essential for advancing sustainable management practices and effectively contributing to global sustainability goals.

The findings affirm the pivotal role of SDGs in steering sustainable development and reveal a prevalent use of materiality analysis as a reporting practice to address sustainability issues and opportunities.

References

1. ABSHAGEN, M.; CAVAZZINI, A.; GRAEN, L.; OBENLAND, W. Analysis Highjacking the SDGs? The private sector and the sustainable development goals. Berlin: Global Policy Forum, 2018. Disponível em: <https://www.globalpolicy.org/component/content/article/271-general/53058-highjacking-the-sdgs-the-private-sector-and-the-sustainable-development-goals.html>. Acesso em: 29 out. 2023.
2. ACCOUNTABILITY. AA1000 Accountability Principles. Disponível em: <https://www.accountability.org/>. Acesso em: 29 out. 2023.

3. VALENTE, B. C.; COTRIM, S. L.; GASQUEZ, A. C.; LAPASINI, G. C. Leal; GALDAMEZ, E. V. Cardoza. Sustainability indicators in industries: A bibliometric review. *RISUS - Journal on Innovation and Sustainability*, v. 9, n. 3, 2018. ISSN: 2179-3565.
4. VALENTE, B. C.; LEAL, G. C. L.; FERREIRA, A. M.; COTRIM, S. L. Indicators' selection method for implementation of sustainability reports in agro-industrial cooperatives. *Latin American Journal of Management for Sustainable Development*, v. 5, n. 2, 2021.
5. INTERNATIONAL COUNCIL OF BIOTECHNOLOGY ASSOCIATIONS. *Biotechnology: Driving solutions for sustainable development*. ICBA, 2020. Disponível em: <https://internationalbiotech.org/biotechnology/biotech-sdgs/>. Acesso em: 29 out. 2023.
6. ASOCIACIÓN ESPAÑOLA DE BIOEMPRESAS. *Biotechnology in the sustainable development goals*. ASE BIO, 2020. Disponível em: <https://asebio.com/sites/default/files/2021-10/Biotech%20in%20the%20sustainable%20development%20goals.pdf>. Acesso em: 29 out. 2023.
7. CALABRESE, A.; COSTA, R.; LEVIALDI GHIRON, N.; MENICHINI, T. Materiality analysis in sustainability reporting: a tool for directing corporate sustainability towards emerging economic, environmental and social opportunities. *Technological and Economic Development of Economy*, v. 25, n. 5, p. 1016-1038, 2019a.
8. CALABRESE, A.; COSTA, R.; LEVIALDI, N.; MENICHINI, T. Integrating sustainability into strategic decision-making: A fuzzy AHP method for the selection of relevant sustainability issues. *Technological Forecasting and Social Change*, v. 139, p. 155-168, 2019b.
9. CARPEJANI, P.; PINHEIRO DE LIMA, E.; GOUVEA DA COSTA, S. E.; MACHADO, C. G.; DA VEIGA, C. P. The contribution of the process of materiality to the evolution of the field of sustainability performance measurement. In: *Proceedings of the International Joint Conference - ICIEOMADINGOR-IISE-AIM-ASEM (IJC 2017)*. 2017.
10. CAMPOS, C. J. G. Método de Análise de Conteúdo: Ferramenta para a Análise de Dados Qualitativos no Campo da Saúde. *Bras Enferm*, v. 57, n. 5, p. 611-614, 2004.
11. COSTA, R.; MENICHINI, T.; SALIERNO, G. Do SDGs Matter for Business? Using GRI Sustainability Reporting to Answer the Question. *European Journal Of Sustainable Development*, v. 11, n. 1, p. 113, 2022.
12. FONT, X.; GUIX, M.; BONILLA-PRIEGO, M. J. Corporate social responsibility in cruising: Using materiality analysis to create shared value. *Tourism Management*, v. 53, p. 175-186, 2016.
13. GLOBAL REPORTING INITIATIVE. *SDG Compass: The Guide for Business Action on the SDGs*. 2015. Disponível em: https://sdgcompass.org/wp-content/uploads/2016/05/019104_SDG_Compass_Guide_2015_v29.pdf. Acesso em: out. 2023.
14. GLOBAL REPORTING INITIATIVE. *GRI 101: Foundation 2016*. Amsterdam: Global Reporting Initiative, 2016. Disponível em: <https://www.globalreporting.org/standards/media/1036/gri-101-foundation-2016.pdf>. Acesso em: out. 2023.

15. GLOBAL REPORTING INITIATIVE. Integrating the SDGs into Corporate Reporting: A Practical Guide. Amsterdam, The Netherlands: Global Reporting Initiative and UN Global Compact, 2018.
16. HAJER, M.; NILSSON, M.; RAWORTH, K.; BAKKER, P.; BERKHOUT, F.; DE BOER, Y.; et al. Beyond cockpits: Four insights to enhance the transformative potential of the sustainable development goals. *Sustainability*, v. 7, n. 2, p. 1651-1660, 2015.
17. LALAGUNA, P. D. Y.; DORODNYKH, E. The role of private-public partnerships in the implementation of sustainable development goals: Experience from the SDG Fund. In: FILHO, W. L. (Ed.). *Handbook of Sustainability Science and Research*. Cham: Springer, 2018. p. 969-982.
18. MUÑOZ-TORRES, M. J.; FERNANDEZ-IZQUIERDO, M.; RIVERA-LIRIO, J. M.; LEÓN SORIANO, R.; ESCRIG OLMEDO, E.; FERRERO-FERRERO, I. Materiality analysis for CSR reporting in Spanish SMEs. In: *Proceedings of the 8th International Conference on Corporate Social Responsibility*, 2013.
19. ZAGO, P. C.; COTRIM, S. L.; LEAL, G. C. L.; GALDAMEZ, E. V. C.; FERREIRA, M. A. An industrial symbiosis method applied to waste management. *Environmental Engineering and Management Journal*, v. 20, n. 6, p. 905-915, 2021.
20. SULLIVAN, K.; THOMAS, S.; ROSANO, M. Using industrial ecology and strategic management concepts to pursue sustainable development goals. *Journal of Cleaner Production*, v. 174, p. 237-246, 2017.
21. UNITED NATIONS GLOBAL COMPACT. About the Sustainable Development Goals. *SDG compass. The guide for business action on the SDGs*. Disponível em: <https://unglobalcompact.org/sdgs/about>. Acesso em: 29 out. 2023.
22. LOKKO, Y.; HEIJDE, M.; SCHEBESTA, K.; SCHOLTÈS, P.; VAN MONTAGU, M.; GIACCA, M. Biotechnology and the bioeconomy—Towards inclusive and sustainable industrial development. *New Biotechnology*, v. 40, Parte A, p. 5-10, 2018. Disponível em: <https://doi.org/10.1016/j.nbt.2017.06.005>. Acesso em: 29 out. 2023.