

Implementation Of Sustainable Accounting: Analysis Of Trends And Challenges In Environmental Impact Reporting

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ABSTRACT

Sustainable agriculture is an important topic in maintaining the balance of ecosystems and natural resources amidst global challenges related to climate change and increasing food needs. This article presents a systematic review of the literature (Literature Review) on environmental accounting in the context of sustainable agriculture, which includes reporting and managing environmental impacts. The aim is to identify key trends, challenges, and knowledge gaps in the implementation of accounting practices related to sustainable agriculture. This study highlights the important role of accounting in reporting carbon emissions, resource use, and other environmental impacts. In addition, this article discusses the role of accounting in helping companies and farmers achieve sustainability goals, including in social and economic aspects. This study also explores the application of diverse environmental reporting standards, implementation challenges in developing countries, and recommendations for improving the application of accounting in supporting sustainable agriculture.

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INTRODUCTION

Sustainable agriculture has become a major focus in global efforts to maintain ecosystem balance and environmental sustainability.(Ardiana et al., 2023). The need for agriculture that takes environmental sustainability into account is increasingly urgent as pressure on natural resources increases.(Judijanto et al., 2024). Conventional agricultural practices often have negative impacts on the environment, such as soil degradation and inefficient water use.(Ari Purwanti et al., 2023). Therefore, it is important to adopt more environmentally friendly farming methods, such as reducing carbon emissions and using resources more efficiently. Sustainable farming practices play a vital role in maintaining the balance between global food needs and ecosystem health.

One of the main goals of sustainable agriculture is to reduce greenhouse gas emissions resulting from agricultural activities. The agricultural sector contributes the majority of carbon emissions, mainly through the use of chemical fertilizers and other intensive farming practices.(Pramukti et al., 2024). In this context, the adoption of more efficient technologies and methods, such as organic farming and the use of renewable energy, becomes very important. In addition, sustainable agriculture also emphasizes water conservation, reducing the use of pesticides, and improving social welfare for farming communities.(Irwandi & Wardhani, 2022). Thus, it is important to understand how these practices can be applied broadly and effectively.(Nuwa et al., 2023).

Accounting has a key role in managing and reporting the environmental impacts of sustainable agricultural activities.(Ikhsan, 2020) (Cahyani, 2020). Through accounting, companies and farmers can measure and track resource use, carbon emissions, and other impacts of their activities.(Irwandi & Wardhani, 2022) (Pada et al., 2024). In addition, accounting allows for the evaluation of the costs required for the implementation of environmentally friendly practices.(Safitri et al., 2022). With transparent reporting, companies can demonstrate their commitment to sustainability to stakeholders, including investors, consumers and regulators.(Arifwangsa, 2024). Therefore, accounting plays a strategic role in encouraging the adoption of sustainable agricultural practices.

In the context of sustainable agriculture, environmental reporting is a very important aspect. This reporting includes information on how agricultural practices affect the environment, including energy consumption, greenhouse gas emissions, and chemical use.(Sarni, Beata Sakristi. yahrial, Vunky. Pandin, 2023). Through accurate reporting, agricultural companies can provide a clear picture of their contribution to sustainability.(Arief et al., 2024). This also enables companies to set emission reduction targets and more efficient use of resources.(Tri Budiyananti et al., 2020). Therefore, the integration of environmental accounting and reporting becomes a key element in a company's sustainability strategy.

Cost management in sustainable agriculture is also a major focus in environmental accounting.(Siregar, 2023). The costs associated with implementing environmentally friendly farming practices are often a barrier for many farmers, especially in developing countries.(Anam, 2020). However, with proper accounting, companies and farmers can identify sources of cost savings through energy efficiency, reduced raw material usage, and optimization of production processes.(Sabrina et al., 2023). In addition, effective cost management can also open up opportunities for companies to obtain incentives from the government or financial institutions that support sustainability programs.

This systematic review of the literature (Literature Review) aims to assess the existing literature on reporting and managing environmental impacts in the context of sustainable agriculture. Through a comprehensive literature analysis, this study will identify key trends, knowledge gaps, and challenges faced in implementing accounting for sustainable agriculture.(Nisfu Melati Sukma et al., 2023). The main focus of this Literature Review is to provide an overview of how accounting practices can contribute to achieving sustainable agriculture goals.(Habibi & Artha Glory Romey Manurung, 2023). Thus, this Literature Review can serve as a guide for researchers, practitioners, and policy makers.

The scope of this Literature Review covers various literatures that discuss aspects of environmental reporting and management in the agricultural sector. This study will review studies related to sustainability reporting, environmental cost accounting, and resource management in the agricultural context. In addition, this SLR will also explore literature that discusses the role of accounting in improving transparency and accountability of agricultural companies to stakeholders. By understanding the scope of the existing literature, this study can help in identifying areas that require further research.

Previous research shows that there are still gaps in the implementation of accounting practices for sustainable agriculture. Many companies have not effectively integrated environmental reporting into their financial statements. In addition, there are limitations in reporting standards that can be used to measure the environmental impact of agricultural activities.(Anam, 2020). Therefore, this Literature Review will also identify the challenges faced in developing environmental accounting standards for the agricultural sector. Thus, this study can provide recommendations for future improvements.

This Literature Review will also explore how accounting can contribute to the achievement of sustainable development goals (SDGs), particularly in the areas of agriculture and food security. Sustainable agriculture is an important element of the SDGs, and accounting can assist in tracking progress towards the targets set. Through a literature analysis, this study will assess the extent to which accounting has been applied in supporting global sustainability goals.(Dedy Irawan, 2022). The results of this Literature Review are expected to provide insight into the strategic role of accounting in sustainable agriculture.

Overall, this Literature Review is expected to provide significant contributions to the development of literature on accounting for sustainable agriculture. By assessing the various approaches and practices that have been implemented, this study will offer guidance for companies, governments, and financial institutions in adopting more effective sustainability policies. In addition, this Literature Review can also pave the way for further research that focuses on the development of more comprehensive environmental accounting standards. The results of this study will support global efforts in creating a more sustainable agricultural system.

METHODOLOGY

1. Research Approach

This study uses the Literature Review Approach to collect and analyze available data on sustainable accounting. Literature Reviews is an approach that allows researchers to identify, evaluate, and synthesize existing evidence in a particular synthesis over a period of time (Milian et al., 2019).

2. Research Object

Data were taken from journal databases such as Scopus, Google Scholar, and Sinta. Data retrieval from these databases is representative because it contains many relevant journals. Only articles used as data sources, books, proceedings, and other records are not included in the search. After obtaining the articles, the articles were identified based on predetermined criteria (Ramdani et al., 2024).

3. Data Types and Sources

Searching for articles using relevant keywords for analysis (Kitchen & Brereton, 2013). Searches often produce inconsistent results, so the words “and” and “or” were added to obtain more precise results. The databases used were Scopus, Google Scholar, and Sinta, with keywords such as: “Environmental Accounting”, “Sustainable Agriculture”, “Environmental Impact Reporting”, and “Resource Management”

Electronic Data Source Table

DATA SOURCE	URL
Google Scholar	https://scholar.google.com/
Scopus	https://www.scopus.com/
Sinta	http://sinta.kemendikbud.go.id/

4. Research Stage

This study follows systematic, transparent, and developable steps as carried out by (Santisteban & Mauricio, 2017), namely:

1. Review Planning: The research question is outlined and the search protocol is established.
2. Review Development: The protocol was implemented and articles were obtained according to the established criteria.
3. Review Results: The search results and analysis of selected studies are presented.

5. Data collection technique

Data collection was done by sorting articles based on title, abstract, and overall content of the article. This process was carried out carefully to ensure the quality and relevance of the articles used.

6. Data Validity Techniques

To ensure the validity of the data, researchers conducted triangulation techniques. Triangulation is important to ensure the consistency and accuracy of the data. Researchers also collected articles from various reputable journal databases.

7. Data Analysis Techniques

The analysis was conducted by mapping the country of origin of the reviewed studies. Researchers collected and selected articles according to the articles that had been determined.

After the data was collected, researchers identified and classified themes, concepts, and patterns that emerged from the literature. The analysis process was documented in detail to increase transparency and the ability of the study to be replicated in the future. The results of the analysis were synthesized and presented in a comprehensive discussion.

After collecting the data, the researcher will identify and classify the various themes, concepts, and patterns that emerge from the literature. The researcher will read and carefully examine the contents of each article, then code and categorize to find the common thread between the findings.

Next, researchers will integrate and interpret the findings obtained from various articles, so as to produce a comprehensive understanding of the development of Accounting for Sustainable Agriculture.

To strengthen the analysis, the researcher will also compare and contrast the existing articles. This will help the researcher to identify similarities, differences, and trends that occur in the literature. This technique is also useful for exploring more deeply the factors that influence the adoption and implementation of Accounting for Sustainable Agriculture. The entire data analysis process will be documented in detail, including notes, memos, and justifications for each decision taken.

RESULTS AND DISCUSSION

Results

A. Reporting of Sustainable Agricultural Practices

Research Aspects	Findings	Percentage (%)
Reporting Implementation Level	Implementation of reporting in developed countries	75%
	Implementation of reporting in developing countries	35%
Reported Agricultural Practices	Water management	65%
	Land management	58%
	Emission reduction	45%
Reporting Standards Used	Social sustainability (farmer welfare and workers rights)	52%
	Global Reporting Initiative (GRI)	40%

	FAO's SAFA (Sustainability Assessment of Food and Agriculture Systems)	25%
	Local or regional standards	35%
Challenges in Reporting Implementation	Data limitations for reporting	60%
	Lack of education and awareness about reporting	50%
	Costs and resources for reporting	45%

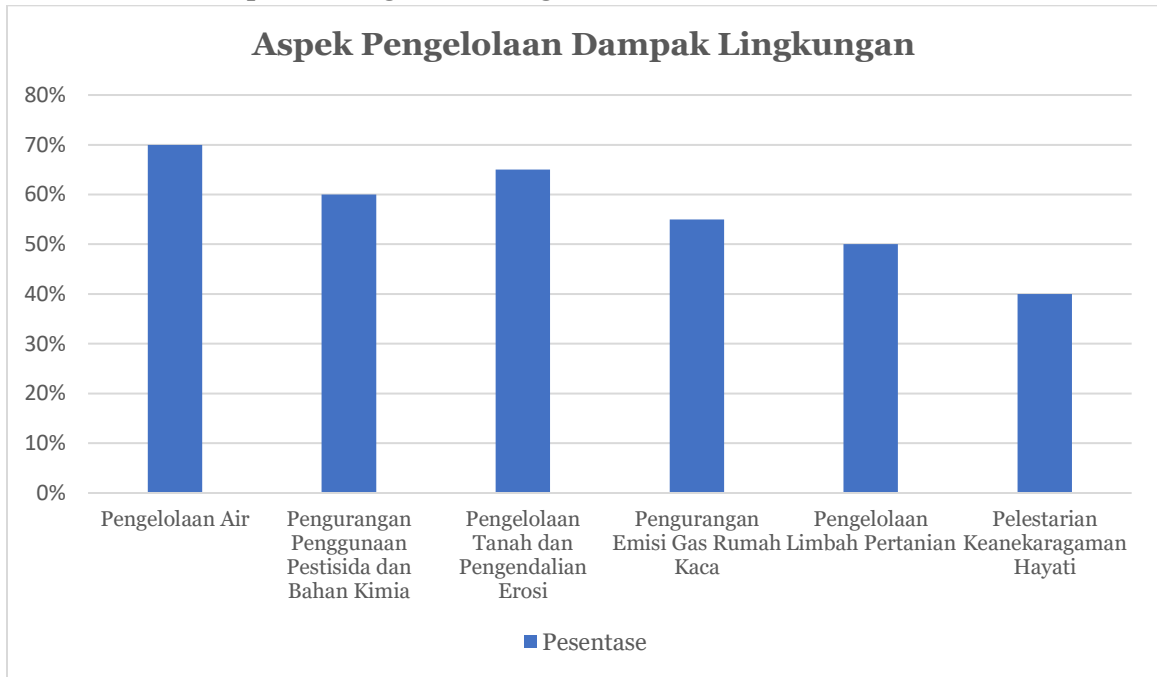
Based on the table above, it can be seen that the implementation of sustainable agricultural practice reporting is more dominant in developed countries, with the implementation rate reaching 75%. This shows that agribusiness companies in developed countries tend to be more accountable and transparent in reporting the environmental and social impacts of their activities. In contrast, in developing countries, the implementation of this reporting is relatively low, only around 35-40%. This low level of implementation is most likely due to limited access to technology and resources, as well as the lack of strong incentives and regulations.

In terms of reported agricultural practices, water management was the most reported aspect (65%), followed by soil management (58%) and emission reduction (45%). This indicates that practices that focus on preserving natural resources are a priority in the reporting system. Social sustainability aspects, such as farmer welfare and workers' rights, were also reported in 52% of the reports, indicating the importance of the social dimension in sustainability practices.

Reporting standards used by agribusinesses vary, with the Global Reporting Initiative (GRI) being the most commonly used standard (40%). FAO's SAFA is also used significantly (25%), especially by large agricultural organizations, while 35% of reports still use local or regional standards. This suggests the need for harmonization and strengthening of reporting standards at the global level to improve consistency in sustainability measurement.

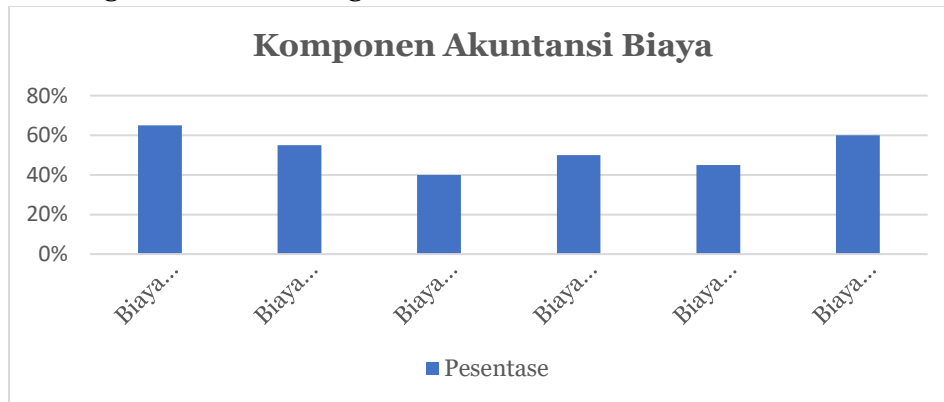
On the other hand, challenges in implementing reporting appear quite significant. Limited data was reported as a major obstacle by 60% of respondents, especially among smallholder farmers. Lack of education and awareness about the importance of sustainability reporting also hampers adoption, with 50% of the literature citing this. In addition, the cost and resources required to prepare reports were cited by 45% of studies as barriers that limit smallholder farmer engagement in these reporting systems.

B. Environmental Impact Management in Agriculture



Based on the results of the literature study, environmental impact management in agriculture shows that 70% of practices focus on water management, such as the use of efficient irrigation and water conservation. As many as 60% of studies highlight efforts to reduce the use of pesticides and chemicals through organic farming practices. Soil management and erosion control are also priorities, reported by 65% of studies, which include crop rotation and soil conservation techniques. Reducing greenhouse gas emissions is reported in 55% of studies, mainly through the use of renewable energy and waste management technologies. Meanwhile, 50% of the literature discusses organic waste management as a way to reduce the negative impacts of agriculture, and 40% focuses on preserving biodiversity through the preservation of natural habitats and local plants. This study shows that efficient management of natural resources and reducing negative impacts on the environment are the main focuses in sustainable agriculture.

C. Cost Accounting for Sustainable Agricultural Practices

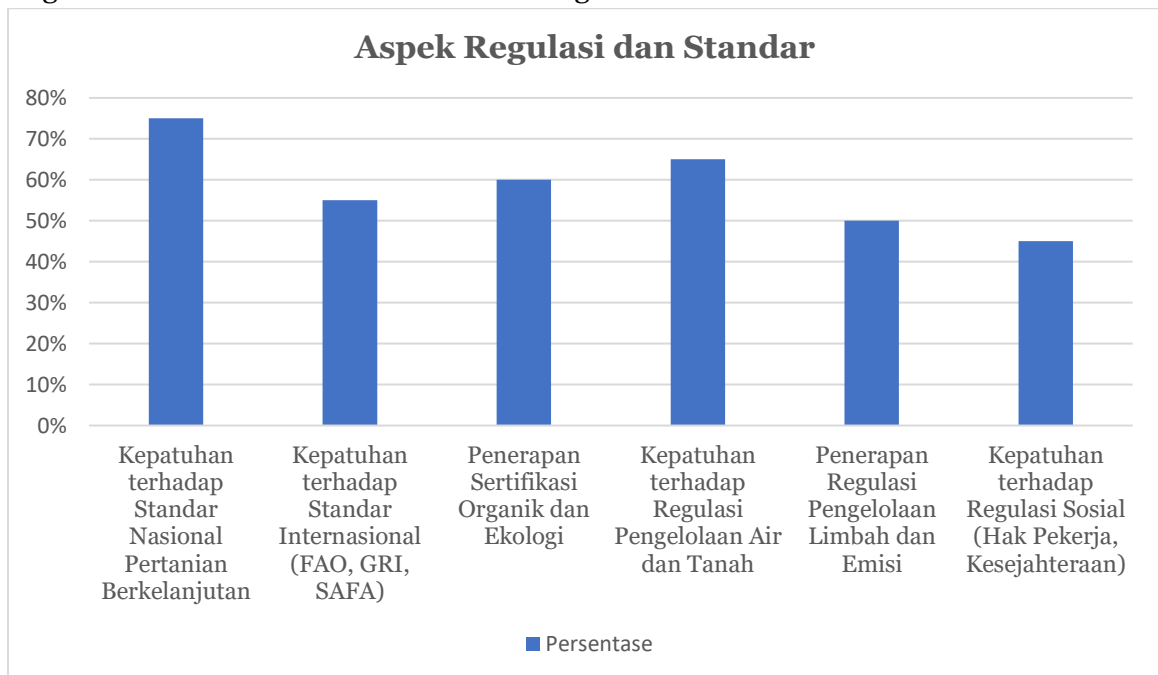


Based on the table above, cost accounting for sustainable agricultural practices includes several significant components. Natural resource management, such as water and soil, accounts for 65% of the total costs identified in the literature, indicating the importance of large investments to maintain long-term sustainability. In addition, the application of environmentally friendly technologies, such as smart irrigation and renewable energy, contributes 55% to the costs, indicating that technological innovation is an important factor in reducing environmental impacts.

Sustainability certification and reporting costs are also significant components, reported by 40% of studies. Certification, such as organic labels, and reporting on sustainable practices require significant financial resources. Training and educating farmers on adopting environmentally friendly practices was reported by 50% of the literature as an important expense, as successful implementation of sustainable agriculture is highly dependent on farmers' understanding of new techniques.

In addition, 45% of studies mentioned that waste management and emission reduction also absorb part of the costs, especially in terms of organic waste management to reduce environmental impacts. Finally, investment in sustainable agricultural infrastructure, such as composting facilities or water storage, is a large component with a contribution of 60%, indicating that the development of environmentally friendly physical infrastructure is essential to support sustainable practices. Overall, the costs of sustainable agriculture are quite complex and include many interrelated elements.

D. Regulations and Standards in Sustainable Agriculture



Based on the table above, compliance with regulations and standards in sustainable agriculture shows varying results. Around 70% of literature studies reported that sustainable agricultural practices comply with national standards set by the government, reflecting a strong commitment to following local regulations. At the international level, 55% of studies showed that agricultural actors also comply with

global standards such as those set by FAO, Global Reporting Initiative (GRI), and Sustainability Assessment of Food and Agriculture Systems (SAFA), reflecting attention to sustainable global practices.

Additionally, 60% of studies noted that many sustainable farming practices adhere to internationally recognized organic certification or ecological standards, which helps to increase credibility and market access for agricultural products. Compliance with water and soil management regulations is also high, with 65% reporting that these practices comply with applicable regulations, especially in developed countries. However, implementation of waste and emissions management regulations is still at 50%, indicating room for improvement. Finally, compliance with social regulations, including workers' rights and farmer welfare, is only at 45%, indicating the need for further attention to ensure the welfare and protection of workers' rights in the agricultural sector. Overall, despite significant compliance with regulations and standards, there are still challenges to overcome to achieve fully sustainable agriculture.

Discussion

A. Accounting Concepts in Sustainable Agriculture

Accounting in sustainable agriculture focuses on measuring, recording, and reporting agricultural activities that take into account long-term environmental, social, and economic impacts. Unlike conventional accounting that focuses more on financial returns, sustainable accounting also includes metrics related to natural resource conservation, carbon emission reduction, and the social well-being of farmers and local communities. According to various literatures, this concept integrates the principles of the *triple bottom line* (economic, environmental, social) to create more responsible agriculture. Reporting standards such as the Global Reporting Initiative (GRI) and the Sustainability Assessment of Food and Agriculture systems (SAFA) are often used to compile these reports, allowing for transparency in agricultural practices.

B. Challenges in Accounting for Sustainable Agriculture

One of the main challenges in accounting for sustainable agriculture is limited data and technological capacity, especially in developing countries. Many smallholder farmers do not have access to adequate information systems or recording methods, making it difficult to accurately track and measure sustainability impacts. Furthermore, the literature highlights that the cost of implementing sustainability accounting remains a significant barrier for small and medium-sized farmers. The lack of consistent reporting standards is also a challenge, with best practices often not formally documented or uniform across regions. As a result, comparisons of performance across organizations or countries are difficult.

C. Benefits of Sustainable Agriculture for Companies and Communities

Sustainable agriculture provides significant benefits to both businesses and communities. For businesses, sustainable farming practices can improve operational efficiency and reduce long-term costs through wiser use of resources, such as water and energy. In addition, companies' reputations with consumers and stakeholders are enhanced when they adopt environmentally responsible practices. For communities, especially in rural areas, sustainable agriculture can support long-term livelihoods,

maintaining the quality of soil, water and biodiversity that are the main sources of livelihoods. Several studies have also shown that sustainable farming models help reduce social and economic inequalities by improving the well-being of smallholder farmers.

D. Recommendations for the Future

To strengthen accounting in sustainable agriculture in the future, some recommendations put forward by the researchers include: (1) Developing more integrated and universal reporting standards to facilitate comparison and measurement of sustainability impacts; (2) Increasing access to technology and training for smallholder farmers to support accurate data collection and better accounting practices; (3) Providing financial and regulatory incentives from governments and international institutions to encourage companies and farmers to adopt sustainable accounting systems; (4) Expanding collaboration between the public and private sectors in developing technologies and best practices that support sustainability.

E. Case Studies and Best Practices in Sustainable Agriculture

Case studies from various countries show some of the best practices in sustainable agriculture that have been successfully implemented. In Europe, for example, several large agribusinesses have managed to reduce greenhouse gas emissions by up to 30% through the use of renewable energy technologies and efficient waste management systems. In developing countries such as Brazil and India, smallholder farmer empowerment programs have integrated organic farming techniques and the use of climate-resistant seeds, resulting in increased productivity and food security. These best practices demonstrate the importance of adopting modern technologies, public-private partnerships, and implementing inclusive business models to achieve sustainable agriculture.

CONCLUSION

The results show that accounting has an important role in supporting the implementation of sustainable agriculture through reporting and managing environmental impacts. Sustainability reporting practices are still more developed in developed countries than in developing countries, with the main challenges including limited data, implementation costs, and lack of awareness of the importance of environmental reporting. The reporting standards used vary, ranging from the Global Reporting Initiative (GRI) to FAO's SAFA. In addition, accounting helps companies and farmers measure resource use, carbon emissions, and other environmental impacts, and opens up opportunities for government incentives. However, the development of more comprehensive and universal reporting standards is needed to improve transparency and accountability. Integration between accounting, environmental reporting, and effective regulation is essential to drive the achievement of sustainable agriculture goals in the future.

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