

An analysis of corporate governance factors influencing sustainability reporting disclosure in the Malaysian agro-industry

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Abstract

Purpose – The effects of corporate governance characteristics such as board independence, board gender diversity, board experience and sustainability committee on sustainability reporting are examined in the context of Malaysian agro-industry companies.

Design/methodology/approach – A fixed effects regression with Driscoll-Kraay standard error and generalized method of moments (GMM) analysis was employed in this study to analyze the sustainability reporting of 56 publicly listed agro-industry companies over eight years (2016–2023) using a newly developed sustainability reporting index (SRI).

Findings – The findings suggest that having a sustainability committee is vital in enhancing sustainability reporting, as demonstrated by its strong positive relationship with sustainability reporting disclosure. Additionally, board gender diversity and board experience show a significant positive relationship with sustainability reporting, whereas board independence shows a negative relationship.

Practical implications – The observations from this study provide important perspectives on the significance of sustainability committees in companies, diversity and experience with sustainability-related board of directors' appointments.

Social implications – The findings provide practical insights for corporate governance stakeholders and policymakers in striving to enhance clarity as well as responsibility in sustainability reporting.

Originality/value – The newly constructed SRI enhances the ability to evaluate sustainability practices, making a meaningful contribution to the literature by offering a robust, multidimensional measure.

Keywords Corporate governance, Agriculture companies, Sustainability reporting index, Malaysia, Sustainability committee, GMM

Paper type Research article

1. Introduction

As an emerging economy, Malaysia heavily relies on its agricultural sector, supported by abundant natural resources and a favourable climate. The country is a leading producer of

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Funding: The study is supported by Fundamental Research Grant Scheme (FRGS: Vote No. 59760) from the Ministry of Higher Education of Malaysia (FRGS/1/2023/SS01/UMT/02/8). The authors thank the Ministry for its research support and UMT Centre for Research and Innovation Management in carrying out this research project.

Conflicts of interest statement: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.



cocoa, rubber, and palm oil. However, the increasing demand for agricultural goods, driven by population growth, has exacerbated environmental challenges, particularly in the oil palm and rubber industries. Practices such as peatland exploitation, deforestation, and biomass burning significantly contribute to greenhouse gas (GHG) emissions by releasing substantial amounts of carbon dioxide (CO₂), thereby intensifying climate change (Raihan *et al.*, 2022; Samsudin *et al.*, 2025). The sector's reliance on land expansion is a major driver of these emissions. Raihan *et al.* (2022) demonstrated that agricultural land expansion correlates with a 0.84% increase in CO₂ emissions over the long term. With the extensive use of land, water, and other resources, the sector must prioritize sustainability to mitigate its environmental impact.

Sustainability in the agriculture sector has become a major global concern. Around 81% of consumers now demand that this industry practice more sustainable activities (Buallay, 2022). As a result, companies are engaging in sustainable activities and disclose them in sustainability reports (Aigner *et al.*, 2003; Rankin *et al.*, 2011). According to Rankin *et al.* (2011), sustainability reporting is a corporate tool that shows transparency of an organizations' social and environmental performance by providing stakeholders with the values, principles, governance, and management practices. For agriculture companies, it is important to highlight the companies' commitment to reducing environmental impact (Buallay, 2022). This report is also essential for maintaining the credibility of Malaysia's agro-industry by addressing ethical practices for consumers, besides functioning as a communication tool for environmental preservation and community well-being (Sawani *et al.*, 2010). For example, most companies within this sector disclose information about governance supervision, risk management, gas emissions, adaptation strategies, and stakeholder engagement in compliance with international standards such as the Global Reporting Initiative (GRI). Global issues such as water scarcity, land degradation, and climate change have led society to demand that businesses be more transparent and accountable.

Despite these developments, studies evaluating sustainability reporting practices in Malaysia's agro-industry remain limited. Prior research often focuses on corporate sustainability generally or in other industries (Alodat *et al.*, 2023). Additionally, there is insufficient empirical support for the relationship between sustainability reporting and board expertise (Githaiga and Kosgei, 2023; Lucia and Panggabean, 2018). To fill these gaps, this study examines sustainability reporting through economic, environmental, and social performance indicators and investigates the influence of corporate governance characteristics such as board independence, gender diversity, board experience, and sustainability committees on sustainability reporting in Malaysian agro-industry companies.

This study makes two unique contributions. First, it introduces a newly developed Sustainability Reporting Index (SRI) tailored to agro-industry companies, offering a more robust and context-specific measure of sustainability disclosure. This enhances both the precision and multidimensionality of sustainability assessments in the sector. Second, by applying agency theory, resource dependency theory, and stakeholder theory, the study provides a stronger theoretical lens to explain the mixed effects of board characteristics on sustainability reporting.

For example, while agency theory emphasizes the monitoring role of boards, resource dependency theory highlights how directors' expertise and diversity provide critical resources and perspectives that shape reporting quality. In addition, stakeholder theory highlights how the sustainability committee helps companies meet diverse stakeholders' demand for transparency. Incorporating these perspectives allows for a more comprehensive understanding of the mechanisms at play in the Malaysian agro-industry context.

Empirical evidence is provided using a dataset of 56 agro-industry companies from 2016 to 2023, totalling 448 firm-year observations. To ensure robust and reliable findings, we apply fixed-effects regression with Driscoll-Kraay standard errors and the generalized method of moments (GMM) techniques.

This paper is organized as follows: [Section 2](#) reviews the literature to support hypotheses development. [Section 3](#) outlines the research methodology. Analysis and findings are discussed in [Section 4](#). Additionally, conclusions and recommendations for future research are presented in [Section 5](#).

2. Literature review and hypotheses development

Sustainability reporting has become crucial for businesses aiming to increase accountability and transparency, especially when addressing global issues, such as resource shortages and climate change ([Rustam et al., 2020](#)). It helps stakeholders with vital information about the company's environmental and social impacts, which helps close the knowledge gap between management and the shareholders. By ensuring transparency, sustainability reporting helps mitigate conflicts arising from information asymmetry and differing interests, promotes trust among stakeholders and guarantees that company activities align with shareholder expectations ([Njoroge, 2019](#)).

Most studies on the factors influencing sustainability reporting disclosure (SRD) have been conducted across a wide range of industries (e.g., [Aman and Jaafar, 2020](#); [Aris et al., 2021](#); [Jamil et al., 2021](#)). However, few have focused specifically on agro-industry companies despite the sector's sensitivity to environmental issues. Additionally, the research period in existing studies is often limited. Thus, extending the timeframe would allow for the identification of long-term trends and more robust observations. Moreover, most studies assess SRD using a single framework, such as Sustainability Reporting Guideline (SRG), GRI, or Environmental, Social, and Governance (ESG) standards ([Alahdal et al., 2025b](#)). In contrast, this study measures SRD using a newly developed SRI that combines SRG 2015 and GRI reporting standards.

2.1 Theoretical background

In Malaysia, sustainability reporting gained momentum in 2007. In October 2015, Bursa Malaysia mandated that large public listed companies with RM2 billion and above market value disclose sustainability statements in annual reports, beginning the fiscal year 2016 ([Bursa Malaysia Securities Berhad, 2015](#)). SRG and Toolkit had been introduced to assist companies in meeting the requirements. Other frameworks, such as GRI, further enhanced the reporting quality across economic, social, and environmental aspects ([Buallay, 2022](#)).

According to agency theory, a company represents a contract between a principal, which is the shareholder, and an agent, which is the manager. Conflicts often arise due to different goals and information asymmetry ([Jensen and Meckling, 1976](#)). Sustainability reporting helps reduce uncertainty and gain stakeholders' trust by promoting transparency, lowering monitoring costs, and ensuring management meets with shareholders' interests through companies' information, non-financial performance, and risks disclosures ([Alodat et al., 2023](#); [Hassanein and Hussainey, 2015](#); [Rustam et al., 2020](#)).

Resource dependency theory explains how external resources affect the operation of a company. [Pfeffer and Salancik \(1978\)](#) emphasize that corporate governance characteristics allow companies to minimize dependence or gain resources, as the board is responsible for the company's survival by linking to the external resources. From this perspective, board diversity in gender and expertise provides better resources for the companies.

Stakeholder theory posits that sustainable development and companies' survival depend on the support of all stakeholders ([van der Laan Smith et al., 2005](#)). Therefore, high sustainability information and disclosure were expected in order to meet stakeholders' expectations to gain their support ([Barako and Brown, 2008](#)). Thus, stakeholder theory supports high sustainability disclosure.

In order to monitor management behaviour and ensure accurate and reliable sustainability disclosures, effective corporate governance is important ([Sahu et al., 2025c](#)). The corporate

governance structure, such as board independence, board gender diversity, and the existence of sustainability committees, could influence the accountability of companies' sustainability reports (Ayuso and Argandoña, 2009; Buallay, 2022; Hillman *et al.*, 2000). Thus, applying the multi-theoretical approach could explain how corporate governance characteristics influence sustainability reporting.

2.2 Board independence and sustainability reporting disclosure

Many previous studies found empirical evidence that board independence improves reporting quality because independence implies greater transparency and practices higher sustainability (Alodat *et al.*, 2023; Githaiga and Kosgei, 2023). Corporate governance also improved with higher independent directors as they provide effective oversight of management actions (Alahdal *et al.*, 2025a).

Past research supports the positive effect of board independence on sustainability reporting in Singapore, South Asian countries, and Australia (Hu and Loh, 2018; Masud *et al.*, 2018; Kathy Rao *et al.*, 2012). However, other studies reveal that independence had no significant effect on sustainability reporting, suggesting that independent directors may lack in sustainability-related knowledge (Erin *et al.*, 2022; Jamil *et al.*, 2021; Nguyen, 2020).

Based on agency theory, board independence is important in monitoring and controlling managerial actions. They help ensure sustainability actions are prioritized, reducing information asymmetry, and aligning management actions with shareholders' and stakeholders' interests. As a result, transparency and accountability of sustainability reporting increased (Alodat *et al.*, 2023; Githaiga and Kosgei, 2023). Based on agency theory and the discussion above, the following is the hypothesis:

H1. Board independence has a positive effect on sustainability reporting disclosure.

2.3 Board gender diversity

Another factor that could improve board effectiveness is board gender diversity (Sahu *et al.*, 2025b). Previous studies found a positive relationship between board gender diversity and sustainability reporting and argue that diverse boards offer unique perspectives, ideas and approaches that prioritize accountability and stakeholder engagement (Erben Yavuz *et al.*, 2024; Erin *et al.*, 2022; Fernandez-Feijoo *et al.*, 2014; Githaiga and Kosgei, 2023; Kathy Rao *et al.*, 2012). Female directors not only enhance sustainability reporting in East Africa (Githaiga and Kosgei, 2023) but also in Pakistan, where they could effectively oversee and manage decisions related to sustainability (Mahmood *et al.*, 2018).

Board gender diversity has been explained by resource dependency theory, which states that the main responsibility of directors is to support management in making high-quality strategic decisions, often by building strong environmental linkages between companies and external resources (Pfeffer and Salancik, 1978). With broader networks and linkages, companies could manage sustainability issues more effectively and strengthen their problem-solving capacity (Boyd, 1990; Rao and Tilt, 2016).

With these advantages, this study believes that board gender diversity could enhance the sustainability strategies of a company. Thus, it could help in making high-quality sustainability reporting. Based on the discussion and resource dependency theory, the following is the hypothesis:

H2. Board gender diversity has a positive effect on sustainability reporting disclosure.

2.4 Board experience

Experienced directors are well equipped with the ability to adapt to evolving market demands and incorporate sustainability considerations in corporate decision-making so which could

influence sustainability reporting. According to [Githaiga and Kosgei \(2023\)](#), the board of directors' varied backgrounds, abilities, and professional credentials significantly affect the performance and strategy of companies. With the right expertise of knowledge, experience, training, and skills, sustainability issues could be addressed effectively by experienced directors ([Hillman et al., 2000](#); [Strandberg, 2007](#)).

Based on resource dependency theory, boards not only enhance companies' ability to maintain resources but also provide valuable capital ([Naheed et al., 2021](#)). Their expertise and knowledge in evaluating sustainability risks and opportunities could contribute to effective board oversight. Previous studies have identified the relationship between directors' experience and sustainability reporting disclosures. [Jamil et al. \(2021\)](#) revealed that directors with sustainability-related experience significantly influence sustainability reporting quality by promoting broader and accurate disclosure. [Tong \(2017\)](#) found that experienced boards determine the sustainability reporting disclosures quality in Malaysia.

However, [Umukoro et al. \(2019\)](#) found no significant impact of board experience and sustainability reporting in Nigeria. Thus, the relationship between board experience and sustainability varies upon the situation. Based on resource dependency theory and the discussion above, the hypothesis is as follows:

H3. Board experience has a positive effect on sustainability reporting disclosure.

2.5 Sustainability committee

Sustainability committee responsibilities are evaluating sustainability policies and auditing the operations of companies' sustainability initiatives. Thus, such committees are important in improving sustainability reporting by focussing on sustainability issues and fostering corporate social responsibility (CSR) commitment. According to [Qaderi et al. \(2022\)](#), the existence of a sustainability committee shows the dedication of companies' sustainable development. Based on this discussion, companies with a sustainability committee are expected to engage in more quality sustainability reporting.

[Kılıç and Kuzey \(2017\)](#) found that the sustainability committee has a positive relationship with the sustainability reporting decision. In addition, other researchers (e.g. [Amran et al., 2014](#); [Liao et al., 2015](#)) found that details sustainability reports in companies are likely produced by sustainability and CSR committees. This shows the clear connection between the committee's existence and reporting quality.

Based on stakeholder theory, sustainability reporting disclosures and practices need to satisfy and meet stakeholders' expectations. The establishment of a sustainability committee helps ensure sustainability goals are monitored systematically, reinforcing companies' transparency, stakeholder engagement, and aligning managerial actions with stakeholder expectations ([Amran et al., 2014](#); [Liao et al., 2015](#)). The following hypothesis is based on stakeholder theory and the aforementioned argument:

H4. The Sustainability Committee has a positive effect on sustainability reporting disclosure.

3. Research methodology

3.1 Data

By April 2024, 58 agro-industry companies were listed on Bursa Malaysia. After excluding two companies with incomplete data, mainly due to missing annual and sustainability reports from 2016 to 2023, the final sample consisted of 56 companies. The study analyzed data over eight years, encompassing 448 firm-year observations. The sustainability reports for the years were chosen because they contain the most recent data on the variables being studied. Significant developments in sustainability reporting standards, such as Bursa Malaysia's SRG 2015 and the GRI, may also have had an effect on the quality of disclosures during this period.

The analysis utilized these companies' stand-alone sustainability reports and annual reports as secondary data.

3.2 Variables

3.2.1 Sustainability reporting index (SRI). The SRI has been developed by following Hussainey (2004) in identifying and choosing disclosure items in companies' annual reports. An initial list of topics was compiled based on the Bursa Malaysia SRG and GRI frameworks related only to agro-industry activities. The list was then added by relevant items referring to previous studies to ensure consistency with academic literature (e.g., Aman *et al.*, 2021; Jamil *et al.*, 2021; Zahid *et al.*, 2020). Five academic experts in corporate disclosure and sustainability were chosen to review and validate the index list, which led to refinements, clarity, relevance, and alignment with the definition of sustainability reporting in this study.

As a result of this process, a refined SRI comprising 75 items was developed. The final index integrates both regulatory and scholarly perspectives and serves as a comprehensive instrument for assessing sustainability disclosures in the Malaysian agro-industry.

3.2.2 Measurement of sustainability reporting disclosure. To evaluate the extent of sustainability reporting disclosure among agro-industry companies in Malaysia, this study uses the following indicators: 8 for economic performance, 31 for environmental performance, and 36 for social performance. 75 indicators were included in the SRI, where each item was measured as a binary variable. It received a score of 1 if present in the annual or sustainability reports, and 0 if not. After scoring all the items, each company's total score was calculated by summing up its individual scores.

3.2.3 Corporate governance characteristics. The attributes of corporate governance are crucial in shaping the extent of sustainability reporting disclosures. Effective corporate governance mechanisms are essential for achieving robust sustainability performance. In addition to active involvement from the entire supply chain and other stakeholders, addressing sustainability issues requires multi-level coordination within the company. Consequently, governance has changed to include more comprehensive supervision of business operations, emphasizing sustainability performance (Naciti *et al.*, 2022; Sahu *et al.*, 2025a).

Four important board characteristics, i.e. board independence, gender diversity, board experience, and the presence of a sustainability committee, are the subject of this study as potential determinants of sustainability reporting practices. These factors were chosen because they were empirically supported by earlier research and theoretically aligned with agency theory. Agency theory states that independent directors are in a better position to keep an eye on management objectively, thereby reducing agency conflicts and promoting greater transparency in corporate disclosures (Jamil *et al.*, 2021; Jensen and Meckling, 1976). According to Ong and Djajadikerta (2018), female directors are also frequently linked to a greater commitment to sustainable development, which enhances sustainability initiatives (Saleh and Maigoshi, 2025). Another important consideration is board experience, since directors with extensive industry knowledge can improve oversight skills and help create more informed and credible sustainability disclosures (Erin *et al.*, 2022). Additionally, it is anticipated that sustainability committees will enhance the quality and comprehensiveness of sustainability-related information (Gerwing *et al.*, 2022).

These governance characteristics are especially noteworthy in the Malaysian agro-industry, which faces sustainability risks like deforestation, biodiversity loss, and climate change. Accordingly, independent and diverse boards are essential for managing stakeholder expectations, ensuring legal compliance, and supporting sustainable development goals (Buniamin *et al.*, 2008; Khan, 2022). Despite its importance, few studies have explicitly looked at board governance's influence on sustainability disclosures in Malaysia's agro-industrial sector. This study attempts to fill this knowledge gap.

By examining the influence of these board characteristics, the purpose of this study is to investigate empirically how corporate governance structures might improve sustainability reporting quality, particularly in a field where environmental accountability is on the rise.

3.2.4 Control variables. Control variables were included to reduce the potential effects of missing variables and accurately determine how corporate governance characteristics influence sustainability reporting. This study uses board meetings, firm age, and firm size as control variables, as they may influence the relationships examined.

3.2.4.1 Board meeting. Board meetings reflect board activities and are linked to the amount of disclosed information, such as compensation and CSR disclosure (Azman and Rashid, 2020). Regular board meetings improve sustainability disclosure by encouraging discussions and effective CSR strategies (Liao *et al.*, 2015). Prior research indicates that board meetings have a favourable effect on environmental and social disclosure (Alkayed and Omar, 2023; Giannarakis *et al.*, 2020; Khairreddine *et al.*, 2020). Board meetings refer to the total number of meetings held during the fiscal year.

3.2.4.2 Firm age. Due to the fact that older companies are often more familiar with sustainability and have stronger reporting records, this study accounts for firm age. A positive relationship between firm age and sustainability reporting was found in previous studies (Al-Gamrh and Al-Dhamari, 2014; Fahad and Nidheesh, 2020; Nguyen, 2020). Therefore, a positive relationship was expected.

3.2.4.3 Firm size. Company size also influences sustainability reporting, as larger companies often are more committed to disclosing sustainability due to their greater responsibility expectations (Cormier and Gordon, 2001; Teoh and Thong, 1984). With greater financial resources, larger companies usually face higher expectations of comprehensive sustainability disclosures. Numerous studies have found a positive relationship between firm size and sustainability reporting (Islamiati and Suryandari, 2021; Kuzey and Uyar, 2017; Sulistyawati and Qadriatin, 2019). Therefore, a positive relationship is expected. Table 1 below shows the measurements for all variables.

Table 1. Variable measurement

	Variable	Symbol	Measure	Source
Independent variables	Board independence	<i>BIND</i>	Percentage of independent members on the board	Corporate governance statement in the annual report
	Board gender diversity	<i>BGD</i>	Percentage of female directors to total board members	Corporate governance statement in the annual report
	Board experience	<i>BEXP</i>	Percentage of sustainability-relevant experience among board members	Corporate governance statement in the annual report
	Sustainability committee	<i>SCOM</i>	1 if the firm has a sustainability committee, 0 otherwise	Annual and sustainability report
Dependent variable	Sustainability reporting disclosure	<i>SRD</i>	Score of SRI evaluated using content analysis	Annual and sustainability report
Control variables	Board meeting	<i>BMEET</i>	The total count of board meetings held during the financial year	Statement on corporate governance in the annual report
	Firm age	<i>FAGE</i>	The gap between the current year and the founding year	Annual report
	Firm size	<i>FSIZE</i>	Logarithm of total assets	Financial statements in the annual report

3.3 Statistical test

To examine how corporate governance characteristics influence *SRD*, a fixed-effects (FE) model with Driscoll-Kraay standard errors was employed as the primary estimation method. The suitability of the FE model was confirmed using the Hausman test (Hausman, 1978). The Hausman test yielded statistically significant findings, suggesting that there are unobserved individual effects correlated with the regressors. Furthermore, the Breusch-Pagan Lagrange Multiplier (LM) test was also significant, supporting the use of panel data techniques over pooled OLS by emphasizing the presence of significant variation across entities (Breusch and Pagan, 1979).

To account for time-invariant, firm-specific heterogeneity that might skew the estimation results, the fixed-effects estimator was selected (Wooldridge, 2010). This model specification is well-suited for separating the effects of board characteristics on sustainability reporting because it takes into consideration unobserved firm-level differences. Additionally, to address common econometric issues in panel data, including heteroskedasticity, autocorrelation, and cross-sectional dependence, the study employed Driscoll-Kraay standard errors. This approach improves the reliability of statistical inference by generating robust standard errors that remain consistent even when non-spherical disturbances are present (Driscoll and Kraay, 1998).

To solve problems with omitted variable bias, endogeneity, and reverse causality, the Generalized Method of Moments (GMM) estimator was also used as a robustness check. The system GMM approach works best in dynamic panel settings with short time periods and a large number of cross-sectional units (Arellano and Bover, 1995). Given that previous sustainability disclosure behaviour may influence current governance practices, this method is relevant to the study.

The eight-year empirical analysis, which runs from 2016 to 2023, was chosen to capture recent shifts in corporate sustainability practices, particularly in response to growing market pressures and regulatory scrutiny in Malaysia's agro-industrial sector.

The baseline regression model is specified as follows, where i stands for firms and t for time:

$$\begin{aligned} \text{SRD}_{it} = & \alpha + \beta_1 \text{BIND}_{it} + \beta_2 \text{BGD}_{it} + \beta_3 \text{BEXP}_{it} + \beta_4 \text{SCOM}_{it} + \beta_5 \text{BMEET}_{it} + \beta_6 \text{FAGE}_{it} \\ & + \beta_7 \text{FSIZE}_{it} + \varepsilon_{it} \end{aligned}$$

This regression model was developed with sustainability reporting disclosure (*SRD*) as the dependent variable. The percentage of independent directors (*BIND*), board gender diversity (*BGD*), board expertise (*BEXP*), and the presence of a sustainability committee (*SCOM*) are examples of explanatory variables that make up corporate governance characteristics. To enhance the model's explanatory power, control variables like the frequency of board meetings (*BMEET*), firm age (*FAGE*), and firm size (*FSIZE*) were included.

4. Results and analysis

4.1 Descriptive analysis

The descriptive statistics for sustainability reporting and variables related to agro-industry companies in Malaysia are displayed in Table 2.

Among the 56 companies analyzed, the *SRD* ranges from a maximum score of 61.33 to a minimum score of 2.67. A standard deviation of 16.27 indicates that sustainability reporting disclosures will remain relatively low in agro-industry companies between 2016 and 2023. These findings align with those of previous Malaysian studies (Jamil *et al.*, 2021; Hanapi *et al.*, 2025).

The average value of *BIND* is 48.13, ranging from a maximum of 75 to a minimum of 28.57. The standard deviation was 11.88. This indicates a moderate level of board

Table 2. Descriptive analysis of the variables

Variable	Obs	Mean	Standard deviation	Minimum	Maximum
<i>SRD</i>	448	21.408	16.266	2.667	61.333
<i>BIND</i>	448	48.127	11.881	28.571	75
<i>BGD</i>	448	11.570	11.917	0	37.500
<i>BEXP</i>	448	39.899	31.997	0	100
<i>SCOM</i>	448	0.496	0.501	0	1
<i>BMEET</i>	448	5.685	1.995	4	13
<i>FAGE</i>	448	37.406	25.472	5	107
<i>FSIZE</i>	448	8.973	0.618	7.866	10.339

independence, as the average proportion of independent directors falls slightly below the commonly recommended benchmark of at least 50% (MCCG, 2021). This variability highlights potential differences in corporate governance structures among agro-industry companies in Malaysia. The mean value for *BGD* is 11.57, with a maximum of 37.50, and a standard deviation of 11.92. This indicates a relatively low representation of female directors on boards within the sample. Similarly, the mean value of board experience in sustainability-relevant expertise is 39.90, with scores ranging from 0 to 100 and a standard deviation of 32.00, reflecting considerable variability in board expertise across companies. Regarding the *SCOM*, the average is 49.6%, indicating that a sustainability committee was established in half of the sample companies. The variables have a standard deviation of 0.50.

For the control variables shown in Table 2, the average number of *BMEET* is 5.69, with a standard deviation of 2.0, ranging from 4 to 13. The average *FAGE* is 37.41 years, with the oldest firm being 107 years and the youngest 5 years, with a standard deviation of 25.47. Additionally, the average *FSIZE* is 8.97, ranging from a maximum of 10.34 to a minimum of 7.87, with a standard deviation of 0.62.

4.2 Correlation matrix

A correlation matrix is essential to understand the correlation between variables (Dziuban and Shirkey, 1974). The correlation matrix shows how strongly the dependent and independent variables are correlated. Additionally, it examines potential multicollinearity issues among the independent variables. A pairwise correlation analysis was performed to evaluate the degree of association among the variables, as presented in Table 3.

Table 3 highlights the significant correlations between the dependent variable and several independent variables. The dependent variable, *SRD* shows a statistically notable positive correlation with *BGD*, *BEXP*, *SCOM*, *BMEET*, and *FSIZE* at a 0.01 significance level. *FAGE* also shows a statistically significant positive correlation with *SRD* at the level of 0.05. However, *SRD* demonstrates a very weak and statistically insignificant correlation with *BIND*.

To evaluate multicollinearity among independent variables, the Variance Inflation Factor (VIF) was employed. No multicollinearity was indicated as all VIF values were below the threshold of 10 (Table 4).

4.3 Regression analysis results

The Hausman and Breusch-Pagan Lagrange Multiplier (LM) test results are shown in Table 5. A value of less than 0.01 (highly significant) was yielded by the Hausman test, while the Breusch-Pagan LM test also produces a value below 0.01 (highly significant), indicating a stronger suitability for the fixed-effects model. Additionally, the table includes the fixed-

Table 3. Pairwise correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) <i>SRD</i>	1							
(2) <i>BIND</i>	0.061	1						
(3) <i>BGD</i>	0.241***	0.056	1					
(4) <i>BEXP</i>	0.351***	0.086*	0.058	1				
(5) <i>SCOM</i>	0.561***	0.076*	0.177***	0.325***	1			
(6) <i>BMEET</i>	0.264***	−0.030	0.094**	−0.074	0.121**	1		
(7) <i>FAGE</i>	0.100**	0.286***	−0.144***	0.222***	0.135***	−0.031	1	
(8) <i>FSIZE</i>	0.575***	0.135***	0.192***	0.217***	0.442***	0.315***	0.160***	1

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4. Variance inflation factor

Variables	Collinearity statistics VIF	1/VIF
<i>BIND</i>	1.111	0.900
<i>BGD</i>	1.098	0.910
<i>BEXP</i>	1.190	0.840
<i>SCOM</i>	1.352	0.739
<i>BMEET</i>	1.147	0.872
<i>FAGE</i>	1.200	0.833
<i>FSIZE</i>	1.438	0.696
<i>Mean VIF</i>	1.219	

effects regression results using the Driscoll-Kraay standard errors, which account for heteroscedasticity and autocorrelation.

The findings of the fixed-effects regression analysis regarding the effects of corporate governance characteristics and sustainability reporting are summarized in [Table 5](#). The F-statistic is statistically significant, indicating the model's validity. These outcomes are consistent with those of earlier studies ([Azman and Rashid, 2020](#); [Jamil et al., 2021](#)).

[Table 5](#) illustrates the relationship between sustainability reporting and board independence. The analysis revealed a significant and negative relationship, thereby rejecting [Hypothesis 1 \(H1\)](#). This result is consistent with that of [Haladu and Salim \(2017\)](#), which indicates that the increase in board independence does not lead to a corresponding increase in *SRD*.

This study looks at the impact of board gender diversity and board experience on sustainability reporting, in addition to board independence. The findings of [Githaiga and Kosgei's \(2023\)](#) are consistent with [Hypothesis 2 \(H2\)](#), which is supported by positive and significant results between board gender diversity and sustainability reporting. This suggests that a company's sustainability reporting practices are greatly aided by having women on boards.

At the 0.01 level of statistical significance, board experience also shows a positive relationship with sustainability reporting. This result validates [Hypothesis 3 \(H3\)](#), which states that directors with sustainability-related expertise are more likely to be aware of sustainability issues and disclose relevant information. This result is consistent with those of [Jamil et al. \(2021\)](#).

There is a strong and positive association between the existence of a sustainability committee and sustainability reporting. As in previous studies ([Al-Shaer et al., 2022](#)), these

Table 5. Fixed effect regression results

Variables	FE
<i>BIND</i>	−0.067** (0.0231)
<i>BGD</i>	0.096*** (0.0144)
<i>BEXP</i>	0.031*** (0.0080)
<i>SCOM</i>	4.242*** (0.6792)
<i>BMEET</i>	0.824*** (0.1748)
<i>FAGE</i>	2.377*** (0.2222)
<i>FSIZE</i>	1.267 (0.6812)
Constant	−84.787*** (7.9941)
Observations	448
Hausman test	123.148***
Breusch and Pagan LM test	404.35***
Number of groups	56
F-stat	393.6
Prob > F	1.52e-08
Within R-squared	0.565
Note(s): Standard errors in parentheses	
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$	

findings support [Hypothesis 4 \(H4\)](#), which states that having a sustainability committee greatly improves sustainability reporting practices.

There is a positive and significant association between board meetings and firm age with sustainability reporting at a 0.01 level, regarding the control variables. However, firm size (*FSIZE*) showed no significant association with sustainability reporting.

Overall, most corporate governance characteristics have a significantly positive relationship with sustainability reporting, except for firm size. Among these, the presence of a sustainability committee and firm age have the most substantial positive effects, whereas board independence has a small but significant negative impact.

4.4 Additional analysis

This document presents an analysis of panel data using the Two-Step System Generalized Method of Moments (GMM), addressing issues of autocorrelation and heteroscedasticity. The analysis results of the two-step system GMM were presented in [Table 6](#).

These results align with prior estimations of the primary model. Specifically, the results for *BIND*, *BGD*, *BEXP*, and *SCOM* remain consistent and robust with the fixed-effects regression. However, there were significant variations in the results for *BMEET* and *FSIZE* when compared with the fixed-effects regression model. In the GMM estimation, *BMEET* becomes weakly significant and negatively associated with sustainability reporting. This suggests that when potential endogeneity is controlled, frequent board meetings may not lead to higher *SRD*. This is possibly due to meetings' focus on routine compliance or crisis matters rather than strategic sustainability issues.

Additionally, *FSIZE* demonstrates a significant effect in the GMM estimation, differing from its insignificant result in the fixed-effects regression. The difference may indicate that

Table 6. Two-step system generalized method of moments (GMM) results analysis

Variables	GMM
<i>SRD</i> (−1)	0.589*** (0.0560)
<i>BIND</i>	−0.612** (0.2330)
<i>BGD</i>	0.298*** (0.0661)
<i>BEXP</i>	0.051* (0.0277)
<i>SCOM</i>	4.345*** (1.5463)
<i>BMEET</i>	−1.228* (0.6508)
<i>FAGE</i>	0.076* (0.0430)
<i>FSIZE</i>	5.825*** (1.6034)
Constant	−15.294 (14.7468)
<i>Number of groups</i>	56
<i>Number of instruments</i>	27
<i>F-stat</i>	445.1
<i>Prob > F</i>	0.000
<i>AR(1) p-value</i>	0.019
<i>AR(2) p-value</i>	0.922
<i>Hansen test</i>	23.87
<i>Prob.>Hansen test</i>	0.159
Note(s): Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$	

larger companies affect the *SRD* when reverse causality is addressed, as GMM accounts for the possibility that higher *SRD* attract companies' growth. These highlight that board meeting and firm size are sensitive to the estimation technique.

5. Conclusion

This study examined the effects of corporate governance characteristics on sustainability reporting by utilizing a newly developed Sustainability Reporting Index to offer a comprehensive evaluation of agro-industrial companies in Malaysia. The results from fixed-effects regression and GMM analysis reveal a nuanced pattern where board independence is negatively associated with sustainability reporting disclosure, whereas board gender diversity, board experience, sustainability committees, board meetings, and firm age are positively associated with *SRD*. Firm size, however, does not show a significant influence. These findings highlight that the effects of board characteristics on *SRD* are mixed and contingent on the specific governance mechanism.

The findings contribute to the theory by both supporting and questioning the agency theory. Board gender diversity and board experience exhibit strong positive relationships with *SRD*, suggesting that women and experienced directors provide knowledge, perspectives, and expertise that enhance sustainability initiatives and disclosures. Similarly, the establishment of a sustainability committee demonstrates a strong positive effect, consistent with the expectation that such committees align corporate strategies with sustainability goals. These results support agency theory, which assumes that diverse and capable boards strengthen

monitoring and decision-making for stakeholders' interests. However, the negative effect of board independence challenges agency theory, as independent directors do not appear to enhance sustainability reporting in Malaysian agro-industry firms. This can be explained by resource dependency theory, which highlights that limited sustainability-related expertise reduces their capacity to improve disclosure. Independent directors may also prioritize financial compliance over sustainability considerations, limiting their effectiveness in this domain (Buniamin *et al.*, 2008; Jamil *et al.*, 2021). Moreover, while frequent board meetings show a positive effect in the fixed-effects regression, GMM results reveal inefficiencies, suggesting that agency theory may overlook conflict among stakeholders (Hassanein and Hussainey, 2015). Overall, these findings imply that combining agency, stakeholder, and resource dependency theories offers a more complete view of how governance influences SRD.

In practice, the results highlight the importance of evaluating board composition and governance structures. Appointing directors with sustainability expertise and increasing gender diversity on boards can strengthen SRD and provide organizations with broader perspectives for tackling sustainability challenges. The strong positive effect of sustainability committees further emphasizes their role in coordinating strategies and disclosures, although their impact depends on their authority and role in decision-making. The positive association between firm age and SRD indicates that older firms have stronger governance and reporting practices, offering guidance for younger firms. For policymakers and regulators, these findings underscore the importance of developing clearer guidelines on the functions and responsibilities of sustainability committees to ensure that they contribute meaningfully to sustainability reporting.

Although this study has value, there are still several limitations that indicate the ways of further research. Since the research uses secondary data, it provides limited insights into the internal dynamics of boardroom decision-making. Future studies could adopt mixed-method approaches, such as interviews or surveys with directors, to uncover the qualitative aspects of governance processes. Moreover, the focus on Malaysian agro-industry firms limits generalizability. Expanding the scope to other industries and cross-country comparisons would enhance external validity. Future research could also explore moderating factors, such as regulations, culture, or committee authority, to better understand the conditions under which governance mechanisms strengthen SRD. Finally, as the study identifies association rather than causation, longitudinal or experimental designs could provide stronger evidence of causal mechanisms (Erin *et al.*, 2022; Nguyen, 2020). Furthermore, while sustainability committees are positively associated with disclosure, their effectiveness depends on their authority and strategic role, an area future studies should explore further (Qaderi *et al.*, 2022).

This study contributes to theory by showing both supportive and contradictory evidence for agency theory, to practice by offering concrete guidance for firms and regulators on board composition and sustainability committees, and to future research by outlining avenues for richer and more generalizable exploration of the governance–sustainability nexus.

Availability of data and material

Research data are publicly available in sources identified in the text.

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