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THE FAIR VALUE MEASUREMENT OF BIOLOGICAL ASSETS, DISCLOSURE OF BIOLOGICAL ASSETS AND FINANCIAL PERFORMANCE: THE MODERATING EFFECT OF MANAGERIAL OWNERSHIP

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ABSTRACT

This research aims to investigate the impact of the measurement and disclosure of biological assets on financial performance, and how this relationship is moderated by managerial ownership. Using signaling and agency theory as the theory as the theoretical foundation, the study used a sample size of 22 agricultural companies listed on the Indonesia Stock Exchange (IDX), with an observation period of 2019-2022. Panel data regression analysis was used in the study with a quantitative descriptive approach. The results show that the measurement of biological assets measured by fair value has a significant positive effect on financial performance. Other result shows an insignificant relationship between biological assets disclosure and financial performance. Regarding the moderating effect, the results demonstrate that managerial ownership significant moderating effect on the relationship between the measurement of biological assets and financial performance; meanwhile managerial ownership insignificant moderating effect on the relationship between biological assets disclosure and financial performance.

KEYWORDS *Agency Theory, Biological Assets; Firm Performance; Managerial Ownership; Signaling Theory.*

INTRODUCTION

One of the outcomes of global trade is the emergence of opportunities to engage in global markets and enhance investment prospects. Along with these, the significance of transparency landscape in information dissemination has become increasingly paramount. Financial reporting has gained the attention of investors during their decision-making processes, and companies are increasingly recognizing the potential of transparent reporting in addressing informational needs of stakeholders.

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Recognizing the necessity for structured disclosure practices, regulators have established reporting standards and enhanced the convergence of accounting standards to improve the relevance of disclosures in contemporary business environments, particularly within the agricultural sector. The agricultural sector contributes to economic growth while simultaneously playing a crucial role in fulfilling the requirements of food amid increasing population projections. This sector involves activities characterized by regenerative agricultural practices that result from biological transformations occurring during the growth and development of both living plant varieties and animals (Anderson, 2022). Thus, agricultural accounting practices have been specifically designed to facilitate comprehensive reporting that accurately reflects real conditions. In Indonesia, the accounting treatment for agriculture has been regulated under the Statement of Financial Accounting Standards (PSAK) 69 on Agriculture, which adopts principles from the International Accounting Standards (IAS) 41 on Agriculture developed by the International Accounting Standards Board (IASB).

Biological assets represent a unique characteristic of the agricultural sector and are a primary focus of regulation within this standard. PSAK 69 mandates entities to measure the fair value of biological assets and to disclose these assets both narratively and qualitatively in conjunction with their financial statements. This requirement enhances the quality of agricultural reporting while simultaneously aiding external stakeholders in understanding the characteristics of the agricultural sector. Biological assets refer to living plants or animals that undergo biological transformations, which means that their economic value is continually subject to change over time. The stipulation in PSAK 69 that any changes in the fair value of biological assets, including both gains and losses, must be recognized in the current period's income statement has generated research interest in this topic. Therefore, various studies have begun to explore how this may influence financial performance.

Several studies have examined the fair value measurement of biological assets and its relevance to financial information. Kadri *et al*. (2023) support the notion that the adoption of IAS 41 within the Malaysian Financial Reporting Standard (MFRS) 141 leads to improved financial reporting quality. Similarly, Bispo and Lopes (2022) found that the relevance of IAS 41, following its amendments, provides significant value to accounting information, particularly concerning biological assets measured at fair value. In line with this, Argilés-Bosch *et al*. (2018) discovered that the accuracy of predicting future cash flows improves when biological assets are measured at fair value. Furthermore, Wen-hsin Hsu *et al*. (2019) demonstrated that the fair value measurement of biological assets enhances financial reporting transparency, ultimately incorporating more firm-specific information and motivating investors to engage in stock market trading. Additionally, various studies have confirmed that the disclosure of biological assets positively impacts financial performance (Khodijah and Utami, 2021; Lestari *et al*., 2020; Utami and Prabaswara, 2020) although other findings indicate a negative relationship between biological asset disclosure and financial performance (Ika *et al*., 2024; Alfarisyi *et al*., 2022). Other studies delve deeper into the relationship between biological assets and financial performance by examining the moderating effects of other variables. For example, Khodijah and Utami (2021) focused on the moderating effects of ownership concentration, Likewise Lestari *et al*. (2020) identified that knowledge of renewable energy

significantly influences the implications of biological asset accounting policies and financial performance.

Signaling theory suggests that firms communicate information to external parties in an effort to mitigate information asymmetry (Spence, 1973) and strategically disclose high-quality information. From the perspective of signaling theory, high-quality firms will naturally emit their best signals to be readily captured by investors, including details about what information should be presented and how it should be articulated to mitigate information asymmetry. The effectiveness of signaling can be enhanced by sending more observable signals (Morris, 1987); for instance, disclosing information about biological assets motivated by signaling objectives, such as demonstrating compliance with accounting standards established by regulators and showcasing the firm's characteristics of openness and strong performance.

Concurrently, agency theory also suggests that information disclosure serves as a monitoring mechanism to ensure that agents (managers) act in the best interests of principals (shareholders). The effectiveness of disclosure is indeed influenced by managerial involvement. Delegating authority to managers in running the company allows them flexibility in controlling business decisions. Jensen and Meckling (1976) that agents do not always act to maximize the wealth (utility) of shareholders due to opportunistic behavior or decision-making that diverges from the interests of shareholders, ultimately benefiting the managers themselves. Therefore, agency theory emphasizes the necessity of aligning the interests of managers and shareholders by providing equity ownership incentives.

Prior literature has elucidated that managerial ownership affects financial performance when their wealth is integrated within the firm and aligned with the interests of shareholders (Al Farooque *et al*., 2020), thereby encouraging transparency in reporting to address information asymmetry. Given that the measurement and disclosure of biological assets may be influenced by managerial discretion or flexibility, which can ultimately impact financial performance, this study hypothesizes that managerial equity ownership within the firm's ownership structure may affect corporate strategies or reporting requirements. Moreover, the inconsistent findings from previous research may arise from the failure to account for certain moderating effects. While prior literature has explored the impact of managerial ownership on financial performance in various research contexts, studies examining the moderating effects of managerial ownership in the context of agricultural reporting remain limited, and this aspect has yet to be explored in previous research.

This study seeks to extend the contributions of prior studies by further investigating the influence of the measurement and disclosure of biological assets on financial performance, taking into account the moderating effects of managerial ownership. As far as is known, literature addressing this topic is still limited, particularly in the agricultural sector; thus, this study aims to fill this gap.

Literature Review

Signalling Theory

The assertion that information disclosure can generate responses related on financial performance aligns with the signaling theory, as proposed by Spence (1973). Spence (1973) developed signaling theory in the context of the labor market; however, signalling

is a general phenomenon applicable in any market characterized by information asymmetry (Morris, 1987). Signaling theory focuses on the actions of insiders (signalers) communicate their best qualities to external parties (signal receivers). According to this theory, firms that disclose information are depicted as signalers, while investors or market participants are referred to as signal receivers; moreover, accounting policy choices, including disclosure practices, represent the signals themselves. Signals serve as guidelines for signal receivers (Suhadak *et al*., 2019) and can shape expectations (Liu *et al*., 2020), perceptions, and behaviors (Choudhury *et al*., 2022), and prompting varied reactions (Yasar *et al*., 2020) in decision-making processes.

The literature discussion reveals that fair value measurement for biological assets is considered more accurate than historical cost (Kadri *et al*., 2023; Bispo and Lopes, 2022; Lestari *et al*., 2020; Wen-hsin Hsu *et al*., 2019; Argilés-Bosch *et al*., 2018; Hadiyanto *et al*., 2018; Huffman, 2018). There are at least two potential explanations for why fair value is superior to historical cost, which is insufficiently effective in assessing biological assets. First, estimates derived from historical cost are no longer relevant for biological assets due to market conditions and physical changes (Wen-hsin Hsu *et al*., 2019; Huffman, 2018). Second, determining the economic value of biological assets often involves complex management policies, such as conditions affecting the growth of biological assets (e.g., genetic superiority, maturity, texture), maintenance costs (e.g., nutritional levels, moisture, fertility), or environmental conditions (e.g., diseases, weather). Such uncertainties pose a risk of rendering the information regarding the value of biological assets inaccurate when measured using historical cost. Furthermore, employing historical cost to assess the value of biological assets can distort the information presented in financial statements, as this method does not accurately reflect the real economic value of biological assets. Consequently, it may mislead information users in evaluating financial performance and making investment decisions. In line with this, He *et al*. (2020) confirm that the IASB regards fair value measurement as the most appropriate approach for reflecting the value of biological assets.

Morris (1987) argues that high-quality firms are more likely to adopt accounting policies that enable the quality of their performance information to be effectively captured by external stakeholders. Disclosure, therefore, can be regarded as a positive signal in communicating internal company information. In the context of this study, the disclosure of biological assets exemplifies this notion. Wen-hsin Hsu *et al*. (2019) argue that disclosures regarding biological assets are aimed at assisting investors in understanding the nature and characteristics of agriculture, which closely influence the economic reality of biological assets due to biological transformations. Therefore, when companies disclose more information, stakeholders are likely to interpret the relevant information as a quality signal. Moreover, such disclosures reflect that the company operates its business more effectively than its peers (Ali *et al*., 2022; Harun *et al*., 2020). Signaling theory supports the notion that high-quality firms strategically disclose a broader range of information to the market.

Agency Theory

Jensen and Meckling (1976) assert that an agency relationship arises when the principal (capital owner) engages another party as an agent (manager) to conduct business on behalf of the shareholders (capital owners). The separation of ownership between the

principal and the agent introduces challenges stemming from the delegation of authority. According to Jensen and Meckling (1976), there is a belief that agents do not fully act to maximize the wealth (utility) of shareholders due to the opportunistic behavior of managers or decision-making that diverges from the perspective of shareholders, thereby benefiting only the managers. Consequently, this delegation of authority incurs agency cost implications (Jensen and Meckling, 1976; Raimo *et al*., 2020).

Monitoring mechanisms are often associated with transparent information environments, and in this context, information disclosure serves as a means to mitigate agency problems by controlling managerial behavior in withholding information. The fair value measurement and disclosure of biological assets mandated by PSAK 69 position this disclosure as a tool to assist external parties (investors) in understanding the nature and characteristics of agricultural activities and their relationship to the economic reality generated by biological transformations (Wen-hsin Hsu *et al*., 2019). In practice, the disclosure of information regarding biological assets addresses the limitations of traditional accounting reporting, which focuses on providing financial information (Donkor *et al*., 2024).

From an agency perspective, the importance of aligning the interests of managers and shareholders is also emphasized. Al Farooque *et al*. (2020) and Al Sa'Eed (2018) assert that managerial ownership influences financial performance when managers' wealth is integrated within the firm and aligns with shareholder interests, thereby motivating them to maintain strong financial performance. The role of managerial ownership in enhancing financial performance is also highlighted by Al Farooque *et al*. (2020), particularly in mitigating the dominance of family ownership in publicly listed companies in Thailand and granting managers greater discretion to improve financial performance. Similarly, Abbas *et al*. (2023) find that managerial shareholding by directors fosters transparency in reporting due to their responsibility in addressing information asymmetry. Consequently, managerial ownership within the firm's ownership structure is expected to guide better business decisions and minimize self-serving behaviors.

Hypotheses Development

The Effect of Biological Assets Measurement on Financial Performance

Biological transformations result in physical changes experienced by biological assets, which sometimes entail longer production cycles and gradual physical changes (He *et al*., 2020). This complicates the estimation of the economic value of biological assets when measured using historical cost. The fair value measurement of biological assets provides a more accurate assessment, as companies can estimate assets based on their true value. Consequently, the estimated asset values reported in financial statements become more precise. The value of biological assets can influence the relevance of financial reports when there is a high proportion relative to total asset value; thus, the accuracy of biological asset valuation can impact investors' assessments of financial performance

Kadri *et al*. (2023) investigate the relationship between biological assets measured at fair value and market value among agricultural companies listed in Malaysia from 2018 to 2020. Similarly, Lestari *et al*. (2020), through 328 observations of forestry and plantation companies in Indonesia, and Hadiyanto *et al*. (2018), who analyzed the annual reports of 38 Roundtable on Sustainable Palm Oil-certified agricultural companies, conclude that fair value measurement of biological assets is believed to produce more relevant accounting

information and better reflect the true value of assets or liabilities. Consistent with this, Wen-hsin Hsu *et al*. (2019) provide empirical evidence that IAS 41 reduces stock price synchronicity and makes stock prices more informative. IAS 41 shifts the valuation of biological assets from historical cost to fair value, reflecting their transformative and growth-oriented nature over time. Consequently, fair value becomes the foundational principle of IAS 41, expected to better represent asset values and the financial performance of adopting companies.

Argilés-Bosch *et al*. (2018) highlight the limitations of accounting data based on historical cost (HC), which often fails to predict future cash flows, particularly when biological assets comprise a significant portion of total assets and are critical components of a firm's asset base. Conversely, fair value measurement enhances the predictive power of accounting information regarding cash flows, as it aligns with market expectations of specific assets or liabilities. For biological assets undergoing transformation, fair value updates accounting information continually, making it more precise for forecasting cash flows than HC. This, in turn, provides stakeholders with a robust foundation for evaluating market expectations

Thus, fair value measurement of biological assets is anticipated to enhance financial performance, as the relevance of the reported values reflects the true economic worth. Hence, this study frames the following hypothesis:

H_1: Biological assets measured at fair value have a positive impact on financial performance.

The Effect of Biological Assets Disclosure on Financial Performance

PSAK 69 mandates companies to disclose their biological assets in corporate reports, thereby facilitating the flow of information more effectively, given that the agricultural sector possesses unique characteristics of biological assets distinct from other sectors. Several studies support the notion that the relationship between the disclosure of biological assets and improved financial performance exists. The study conducted by Utami and Prabaswara (2020) indicates a positive correlation between biological asset disclosure and financial performance, which is associated with extensive information disclosure fostering investor confidence; in this context, the disclosure of biological assets acts as a valid signal that reduces information asymmetry. Khodijah and Utami (2021) demonstrate that the disclosure of biological assets positively influences market-based performance measures such as Tobin's Q, a finding that is similarly echoed by Lestari *et al*. (2020), who report a significant positive relationship between biological asset accounting and financial performance.

Companies disclose more information driven by signaling motives, reflecting characteristics of openness to information and substantively complying with accounting reporting requirements. This facilitates the dissemination of information to the market and mitigates agency costs, suggesting that the disclosure of biological assets is expected to positively influence financial performance. In line with signaling theory, firms strive to communicate information effectively as a positive signal to external parties; the specific information disclosed by companies can serve as a signal in their efforts to gain investor trust. On the other hand, from the perspective of agency theory, disclosure is viewed as a mechanism for controlling managerial performance. By disclosing more information, the

tendency for managers to pursue personal interests can be curtailed, thereby reducing agency costs arising from information asymmetry.

Based on these two theories, corporate disclosure practices are underpinned by mutually reinforcing rationales. Signaling theory regards disclosure as a means for firms to communicate information to external stakeholders, while agency theory views disclosure as a control mechanism for managerial performance. Therefore, the second hypothesis that can be proposed is as follows:

H_2: The disclosure of biological assets positively influences financial performance.

The Moderating Effect of Managerial Ownership

The belief that agents (managers) may act in their self-interest during the delegation of authority from principals (shareholders) regarding business decisions can lead to information asymmetry and trigger agency conflicts. This possibility was predicted by Jensen and Meckling (1976) in agency theory. One way to align the interests of managers and shareholders is through providing incentives to managers via equity ownership.

In several studies, managerial ownership has been documented to influence financial performance. For instance, research conducted by Al Farooque *et al*. (2020) on companies listed in Thailand indicates that managerial share ownership impacts financial performance when managers' wealth aligns with that of shareholders. In their conclusion, Al Farooque *et al*. (2020) observed that the presence of managerial ownership successfully mitigates the dominance of certain ownership structures that could otherwise lead to substantial agency costs. Further evidence from developing countries, such as Jordan, is presented by Al Sa'Eed (2018), who demonstrates a positive relationship between managerial ownership and Return on Assets (ROA). Similarly, Al-Ahdal *et al*. (2023) reveal that managerial ownership significantly affects accounting-based performance measures, such as ROA, in companies listed in Oman and the United Arab Emirates (UAE). Moreover, a stronger relationship between managerial ownership and Return on Equity (ROE) is observed among companies listed in Oman, while a significant positive relationship between managerial ownership and Tobin's Q is identified in UAE-listed companies. On the other hand, Alkurdi *et al*. (2021), in their study, report different results, showing a negative relationship between managerial ownership and ROA, with an insignificant effect on market performance measures such as Tobin's Q.

Alabdullah (2018) supports the agency theory notion that ownership structure, as a concept of the separation of ownership and control, positively influences firm performance. Similarly, Al Sa'Eed (2018) and Al Farooque *et al*. (2020) concur that managerial ownership is positively associated with financial performance. High levels of compensation, dividends, and returns motivate managers to enhance profitability by directing and influencing policies and operational decisions when they hold ownership in the company. Based on these findings, the hypothesis developed in this study is as follows:

H_3: Managerial ownership moderates the relationship between the measurement and disclosure of biological assets and financial performance.

RESEARCH METHOD

Sample Selection

This study collected data from 24 agricultural companies listed on the Indonesia Stock Exchange (IDX) for the observation period from 2019 to 2022, resulting in a total of 96 company observations. However, during the sample selection process, it was discovered that the financial statements of one company did not disclose its financial reports in Indonesian Rupiah (Rp) and did not employ fair value in measuring the value of its biological assets. Consequently, this necessitated the exclusion of that company from the research sample, as it did not meet the information requirements for the study. Therefore, the final research sample consists of 22 companies, covering the observation period from 2019 to 2022, with a total of 88 observations

Table 1. Sampling result

Sample Criteria	**Amount**
Agriculture sector firms listed on the IDX (2019 – 2022)	24
Agriculture sector firms not publishing financial report in Rupiah currency (Rp)	(1)
Agriculture sector firms not using fair value for biological asset	(1)
Total Sample Selected	**22**

Variable Measurement

This research employs a quantitative research approach. Data were collected manually using content analysis techniques from financial statements, annual reports, and company websites. Data for the dependent variable, Return on Equity (ROE), and data for the fair value measurement of biological assets (FVBA) were obtained from the companies' financial statements. To evaluate the level of disclosure of biological assets, disclosure items were based on based on the PSAK 69 requirements. Each disclosure item was scored "1" if disclosed and "0" if not disclosed. Consistent with prior literature, managerial ownership was obtained from the companies' websites or annual reports that disclose the percentage of the company's ownership structure.

Dependent Variable

This study utilizes Return on Equity (ROE) to measure financial performance. Based on previous literature, Return on Equity is considered an appropriate proxy for assessing financial performance because it relates to liquidity management, which affects debt structure and involves the management of assets and liabilities. Thus, ROE focuses on returns to shareholders, as noted by El-Ansary and Al-Gazzar (2021). ROE is defined as the percentage of net income to equity, measuring the rate of return on shareholder investment, calculated as follows:

$$\text{ROE} = \frac{\text{Net Income after Tax}}{\text{Total Equity}}$$

Independent Variables

Measurement Fair Value of Biological Asset

This research follows the prior literature (Alfarisyi *et al*., 2022) that employs the fair value measurement of biological assets to examine its impact on financial performance, formulated as follows:

$$\text{FVBA} = \frac{\text{Fair value of biological assets}}{\text{Total Asset}}$$

Biological Asset Disclosure

The disclosure of biological assets is calculated using a disclosure index developed by previous studies, referencing the provisions of PSAK 69 (Alfarisyi *et al*., 2022; Utami and Prabaswara, 2020; Mirović *et al*., 2019; Gonçalves *et al*., 2017).:

$$\text{BAD} = \frac{\text{N}}{\text{K}} \text{ x } 100\%$$

Where *N* represents the total disclosure score reported by the company (with a score of 1 assigned if disclosed and 0 if not disclosed), while *K* represents the total disclosure score mandated by PSAK 69.

Moderating Variable

Managerial ownership refers to the percentage of shares owned by managers, CEOs, or executive officers of the company. This variable is measured as the percentage of total shares held by company executives (Alkurdi *et al*., 2021; Al Farooque *et al*., 2020; Al Sa'Eed, 2018):

$$\text{MAN} = \frac{\text{Managerial ownership shares}}{\text{Total Shares}} \text{ x } 100\%$$

Conceptual Framework

This study assumes that the relationship between the measurement and disclosure of biological assets and their impact on financial performance can be enhanced through the role of managers, given their discretion in making business decisions. Furthermore, it is assumed that managerial equity ownership may lead to operational decisions aimed at maximizing shareholder wealth. Consequently, the relationships among these variables are illustrated in the figure below:

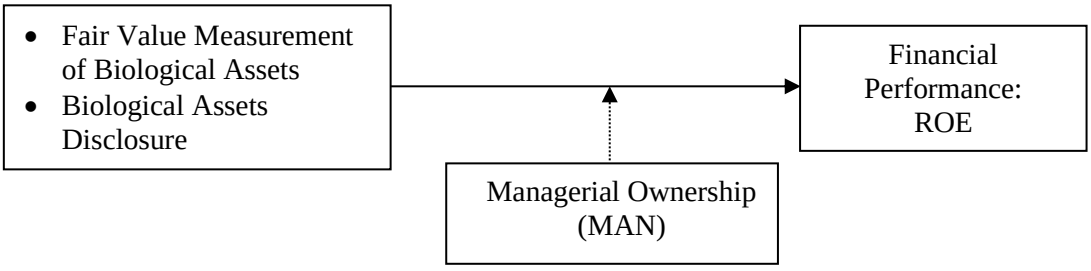

Figure 1. Research Model

Empirical Models

To address the research questions, this study follows previous research and designs several distinct regression equation models. First, in line with the prior literature, the study estimates a basic regression equation to examine the effect of the measurement and disclosure of biological assets on financial performance. The regression equation model I estimated in this study is as follows:

$$FP = \alpha + \beta_1 FVBA + \beta_2 BAD + \varepsilon$$

In the second stage, to examine the moderating effect on the relationship between the independent and dependent variables, the study re-estimates equation I by adding a moderating variable (managerial ownership) and incorporating an interaction variable into the regression equation. The regression equation model II is formulated as follows:

$$FP = \alpha + \beta_1 FVBA + \beta_2 BAD + \beta_3 MAN + \beta_3 MAN*\beta_1 FVBA + \beta_3 MAN*\beta_1 BAD + \varepsilon$$

Where FP represents financial performance, measured by the dependent variable ROE. FVBA (Fair Value Measurement of Biological Assets) and BAD (Biological Asset Disclosure) are the independent variables; MAN (Managerial Ownership) is the moderating variable; α represents the constant; $\beta 1$, $\beta 2$, and $\beta 3$ are the regression coefficients; and ε represents the estimation error.

RESULT AND DISCUSSION

Descriptive Statistics

Table 2 presents the descriptive statistics of all research variables. With respect to the financial performance variable, the results indicate that the average ROE is 0.0084. Regarding biological assets, the proportion of biological assets measured at fair value relative to total assets is 2.5%, which is consistent with the findings of Alfarisyi *et al*. (2022), suggesting that, on average, the value of biological assets owned by companies constitutes 2.5% of their total assets.

Tabel 2. Descriptive Statistics

Variables	Mean	Std. dev.	Min.	Max.
ROE	0,0084	0,4122	-2,5490	0,8984
FVBA	0,0254	0,0219	0,0023	0,1109
BAD	0,5275	0,1304	0,2632	0,7895
MAN	0,0864	0,2299	0,0000	1,0000
Obs.	88	88	88	88

Source: STATA v.17

Meanwhile, the level of biological asset disclosure averages 52.7% of the total required disclosures. The lowest disclosure level is 26.3%, while the highest reaches 78.9%. These findings confirm that corporate compliance with biological asset disclosure ranges between 20% and 70%.

Regarding the moderating variable, the proportion of managerial ownership ranges from a minimum of 0% to a maximum of 100%. These results indicate that within the sample, there are companies with no managerial ownership and others the majority of shares are held by managerial shareholders. On average, the ownership structure in the sample consists of approximately 8.64% managerial shares.

Correlation Matrix

This study also presents the coefficients from the Pearson correlation matrix of all variables used to detect the presence of multicollinearity in the regression analysis. The literature indicates that multicollinearity occurs when the relationship between variables exceeds a value of 0.80, or when there are no signs of multicollinearity, indicated by a Variance Inflation Factor (VIF) value of less than 10.

Table 3. Correlation Matrix

	ROE	FVBA	BAD	MAN	MAN* FVBA	MAN* BAD	VIF
ROE	1,0000						-
FVBA	0,1820	1,0000					1,41
BAD	0,2340	0,3200	1,0000				1,41
MAN	0,0511	-0,0045	0,0091	1,0000			1,05
MAN*FVBA	0,0109	-0,1782	-0,4491	-0,0052	1,0000		1,71
MAN*BAD	-0,0759	-0,2604	0,2771	0,1721	-0,5132	1,0000	1,80

Source: STATA v.17

From the table, it can be observed that the measurement of biological assets at fair value (FVBA) and the disclosure of biological assets (BAD) yield a correlation coefficient of 0.3200, indicating that as the value of reported biological assets increases, the level of disclosure of biological assets also rises. Regarding the moderating variable, only managerial ownership in relation to the measurement of biological assets at fair value (MAN*FVBA) demonstrates a significant positive effect at the 1% significance level.

Regression Analysis

Before conducting the regression analysis, this study performed tests for specific statistical assumptions, including heteroskedasticity and autocorrelation. The Wald test was employed to detect signs of heteroskedasticity, while the Wooldridge test was utilized to examine the presence of autocorrelation in the regression model. Both values must exceed 0.05 to conclude that the regression model is free from signs of heteroskedasticity and autocorrelation.

Table 4. Diagnostic Test

Test	Result
Heteroscedasticity	Chi2 (22) = 22,53
(Wald test)	Prob>chi2 = 0,0000
Serial correlation	F = 1,562
(Wooldridge test)	Prob > F = 0.2251

Based on the table, the Wooldridge test value is 0.2251, indicating that there is no autocorrelation present in the regression model. Meanwhile, the Wald test value is 0.0000,

suggesting the presence of heteroskedasticity. To address this issue, robust standard errors are employed in the regression model (Alshareef, 2024; Jirasek, 2023; Oware and Mallikarjunappa, 2022; Le Thi Kim *et al*., 2021; Buallay *et al*., 2020), which is expected to mitigate biased and inconsistent interpretations.

The Effect of Biological Assets Measurement and Disclosure on Financial Performance

Table 5 presents the results of the regression analysis regarding the relationship between the measurement and disclosure of biological assets and financial performance. The findings indicate that the measurement of biological assets at fair value exhibits a positive and significant relationship with ROE, with a p-value of 0.007. Therefore, these results confirm H_1, asserting that the measurement of biological assets at fair value has an impact on ROE.

Tabel 5. The estimation results of the first model

	ROE	
Variables	Coef.	*p-value*
FVBA	0,096	0,007
BAD	0,082	0,096
R^2	0,0671	
OBS	88	
F-TEST	0,0137	

Source: STATA v.17

In the same table, the disclosure of biological assets in relation to ROE shows an insignificant relationship, with a p-value of 0.096. This indicates that the hypothesis stating that the disclosure of biological assets impacts ROE is rejected (H_2).

The Moderating Effect of Managerial Ownership

To assess the moderating impact of managerial ownership on the relationship between the measurement and disclosure of biological assets and financial performance, regression model I was re-estimated by adding the moderating variable and interaction variables (MAN*FVBA and MAN*BAD) into regression model II.

Tabel 6. The estimation results of the second model

Variables	ROE	
	Coef	*p*
FVBA	0,0624	0,021
BAD	0,1251	0,005
MAN	0,7129	0,000
MAN*FVBA	0,0907	0,005
MAN*BAD	-0,0326	0,175
R^2	0,0904	
OBS	88	
F-TEST	0,0000	

Source: STATA v.17

As shown in the empirical results presented in Table 6, it is revealed that managerial ownership has a positive and significant influence in moderating the relationship between the measurement of biological assets and ROE, indicated by a p-value of 0.005 and a correlation coefficient of 0.0907. These findings support the hypothesis that managerial ownership strengthens the relationship between the measurement of biological assets at fair value and ROE. Furthermore, other analytical results indicate that managerial ownership exerts a negative and insignificant effect (coef. -0.0326, $p < 0.175$) in moderating the relationship between the disclosure of biological assets and ROE. This outcome suggests that managerial ownership does not moderate the relationship between the disclosure of biological assets and financial performance as measured by ROE.

Discussion

The Measurement of Biological Assets on Financial Performance

The empirical results presented in Table 5 for regression model I indicate a positive and significant relationship between the measurement of biological assets and ROE, thus confirming that H_1 is accepted. From the perspective of signaling theory, high-quality firms will naturally emit their best signals to be readily captured by investors, including information on what and how to present in order to mitigate information asymmetry. In this regard, the potential of fair value measurement for biological assets may influence the presentation of financial reports. This implies that as the proportion of biological assets in a company's total assets increases, it becomes essential to present the value of these assets accurately.

Under historical cost methods, the valuation of biological assets is considered less relevant. Firstly, the estimated value derived from historical cost methods is not applicable to biological assets that undergo gradual growth and physical changes. Secondly, there are often additional costs incurred during the biological transformation process of these assets. In contrast, fair value measurement of biological assets can reflect the current market value, and the flexibility of fair value can enhance the accuracy of valuations for biological assets that may lack an active market, thereby increasing the reliability of the information presented.

Indeed, the accuracy of fair value in assessing biological assets can serve as a strong signal that the financial reports accurately reflect the actual conditions, particularly when reporting financial performance, which is a key focus for investors. Accurately presented financial report information can enhance the predictability of future cash flows (Argilés-Bosch *et al*., 2018), thereby assisting investors in two significant ways: by boosting investor confidence and aiding in decision-making (Alfarisyi *et al*., 2022).

The measurement of biological assets, whether through historical cost or fair value, ultimately impacts accounting reporting. Accordingly, adopting accounting policies that disclose high-quality information can serve as a positive signal, helping companies enhance financial performance, consistent with signaling theory

The Disclosure of Biological Assets on Financial Performance

Based on the empirical results presented in Table 5, the relationship between biological asset disclosure and ROE is found to be insignificant, leading to the rejection of H_2. Table 2 indicates that the disclosure index shows that, on average, sample companies meet only 52.7% of the total disclosure items required under PSAK 69. These findings

suggest that compliance with PSAK 69 remains relatively low, reflecting limited efforts to provide comprehensive information on biological assets. The lack of a significant effect between biological asset disclosure and financial performance suggests that some investors do not rely on biological asset disclosures or consider them essential variables in their decision-making processes.

These findings align with those of Alfarisyi *et al*. (2022) and Ika *et al*. (2024). Ika *et al*. (2024) conclude that biological asset disclosures are irrelevant to investors. In evaluating companies, investors tend to disregard the dissemination of information on biological assets and instead rely on other forms of information. Ultimately, these findings are inconsistent with signaling theory, which posits that disclosure can serve as a solid signal that attempts to fulfill informational needs and benefit companies by influencing financial performance. Additionally, these findings appear to contradict agency theory, which asserts that disclosure reduces information asymmetry and enhances transparency, thereby decreasing agency costs.

Effect of Managerial Ownership Moderation

Table 6 summarizes the results of the moderating effects of managerial ownership (MAN*FVBA and MAN*BAD) on the relationship between the measurement and disclosure of biological assets and financial performance. It shows that managerial ownership positively and significantly moderates the relationship between the measurement of biological assets and ROE. The same table also indicates that managerial ownership negatively but statistically insignificantly moderates the relationship between the disclosure of biological assets and ROE.

The strong positive moderating effect of managerial ownership is evident in the relationship between the measurement of biological assets and ROE, indicating that the presence of managerial ownership is more closely aligned with shareholder interests. This aligns with agency theory, which states that managerial equity ownership drives operational decisions that can maximize shareholder wealth. The study by Al Farooque *et al*. (2020) explains that the presence of managerial ownership mitigates the influence of dominant ownership that could decrease financial performance and increase agency costs. In the context of this study, the fair value measurement established in PSAK 69 has created incentives for managers to exercise discretion in measuring the value of biological assets (He *et al*., 2020), allowing managers to utilize their skills and best judgments in selecting accounting policies to present biological asset information in financial reports more effectively. Consequently, greater equity ownership by a manager may enhance ROE.

Regarding the moderating effect of managerial ownership on the relationship between the disclosure of biological assets and financial performance, these findings are inconsistent with agency theory, which posits that managerial ownership within the ownership structure aligns the interests of managers with those of other shareholders. The insignificant results may be explained by a self-serving managerial attitude, leading to a lack of desire to disclose more information and reduce information asymmetry. Several previous studies have identified a negative relationship between managerial ownership and disclosure levels (Al Amosh and Khatib, 2022; Fadli *et al*., 2022; Raimo *et al*., 2020; Salem *et al*., 2019). Additionally, findings by Tahir *et al*. (2023) suggest that increased managerial ownership heightens information asymmetry because managers tend to make entrenched decisions and conceal information. Similarly, Fadli *et al*. (2022) note that managerial ownership tends to facilitate easier access to internal information, and having such

information directly (Salem *et al*., 2019) may create a potential for managers to decide to withhold certain information (Al Amosh and Khatib, 2022).

CONCLUSION

This study investigates the moderating effects of managerial ownership on the relationships between fair value measurement of biological assets, disclosure of biological assets, and financial performance. The study aims to examine how the measurement and disclosure of biological assets influence financial performance, as well as whether these relationships are moderated by managerial ownership. The findings provide support for the existing literature that fair value measurement of biological assets significantly and positively correlates with financial performance. Furthermore, additional results indicate that the low level of disclosure of biological assets does not significantly impact financial performance. Thus, due to the limited information disclosed regarding biological assets, some investors do not rely on such disclosures as a variable in their investment decision-making.

Regarding the moderating variable, managerial ownership significantly and positively moderates the relationship between the measurement of biological assets and ROE. These results support agency theory, which states that managerial equity ownership leads to operational decisions that can maximize shareholder wealth, thereby affecting financial performance. However, the moderating relationship of managerial ownership becomes statistically insignificant and negative when examining the relationship between the disclosure of biological assets and ROE, suggesting that this finding does not support the notion that managerial ownership will address information asymmetry by disclosing more information.

This study contributes to the literature on accounting for biological assets (PSAK 69) concerning financial performance. Moreover, these findings offer theoretical contributions to signaling theory and agency theory perspectives. From a signaling theory standpoint, first, this study confirms that fair value measurement in the evaluation of biological assets results in a stronger observed signal regarding the presentation of relevant information. Second, the study illustrates that the insignificant effect of biological asset disclosure on financial performance is due to the low level of disclosure. These results indicate that when the disclosed information is limited, the effectiveness of signaling weakens. Simultaneously, this study provides new insights into the relationships between fair value measurement of biological assets, disclosure of biological assets, and financial performance by examining managerial ownership as a moderating variable. The findings in this study support agency theory, which argues that managerial equity ownership aligns interests with those of other shareholders, evidenced by the positive and significant moderating effect of managerial ownership on the relationship between the measurement of biological assets and ROE.

This study also offers practical implications. First, it suggests that companies enhance the disclosure of biological assets. The insignificant findings regarding the impact of biological asset disclosure on financial performance indicate that although disclosure items have been established by regulators, companies have not fully provided information regarding biological assets optimally. Second, the presence of managerial ownership alone may not be sufficient to support more optimal disclosure of biological assets due to their

potential self-serving behavior. Thus, this study advocates for a more heterogeneous ownership structure as a means to monitor managerial behavior.

Despite the contributions outlined above, this study has limitations that need to be addressed in future research. First, the relatively small sample size limits the generalizability of the findings, necessitating a broader scope of research that includes cross-country studies within Asia. Second, considering that the negative moderating effect of managerial ownership on the relationship between the disclosure of biological assets and financial performance is statistically insignificant, it is essential to expand investigations by considering the heterogeneous ownership structure in influencing the level of information disclosure. Ownership structures with heterogeneous ownership characteristics can provide differing levels of monitoring capacity, including the extent to which information is disclosed.

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