RESEARCH ARTICLE
Published: 31 July 2025
doi: 10.21070/jas.v9i2.2028

Firm Value and Sustainability Assessment of Food and Agriculture Systems

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General Background: Sustainability has become a key focus in the global business sector, requiring companies to address social and environmental impacts alongside financial performance. Indonesia's plantation sector plays a critical role in the national economy, yet the adoption of sustainability standards and its relationship with stock value remains under-explored. **Specific Background:** While previous studies often utilise a generalised or partial approach to sustainability, the FAO's Sustainability Assessment of Food and Agriculture Systems (SAFA) framework offers a more comprehensive evaluation. This study investigates the relationship between the economic dimensions of SAFA and the stock value of plantation companies listed on the IDX over the period 2022-2023. **Knowledge Gaps:** Research linking SAFA implementation specifically to stock value in the plantation sector is limited, and previous findings are inconsistent. **Objective:** To provide empirical evidence that addresses these inconsistencies by assessing the effect of the economic dimensions of SAFA on stock value. **Methods:** A mixed approach with quantitative analysis using Generalised Estimating Equation (GEE) was applied to data on plantation companies listed on the IDX. **Results:** None of the four economic dimensions-Investment, Vulnerability, Product & Information Quality, and Local Economy-showed a significant effect on stock value. **Novelty:** This is the first study to explicitly test SAFA in the context of the Indonesian capital market. **Implications:** The findings suggest that investors may not fully consider sustainability disclosures in investment decisions, highlighting the need for greater awareness and education.

Keywords: Sustainability, SAFA, Stock Value, Plantation, GEE.

OPEN ACCESS
ISSN 2548-3501 (online)
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Accepted: 1 June 2025
Accepted: 27 July 2025
Published: 31 July 2025
Citation:
Septian, Anuar, and Suarsa (2025) ***Firm Value and Sustainability Assessment of Food and Agriculture Systems in IDX Plantations***

INTRODUCTION

In recent years, sustainability has taken centre stage in the global business sector, including in Indonesia. Companies are required to not only focus on financial performance, but also on the social and environmental impacts of their operations (Alaoui *et al*., 2022; Schaltegger *et al*., 2016). The relationship between sustainable business practices and corporate value has been researched in depth, demonstrating the important role sustainability plays in creating long-term value (Luo & Bhattacharya, 2006). One sector that plays a vital role in the Indonesian economy is the plantation sector (Safitri *et al*., 2024; Situmeang *et al*., 2024). The sector contributes significantly to GDP and exports, but also faces major sustainability challenges, such as environmental and social issues (Kumar *et al*., 2020; Subardin, 2006).

Although many plantation companies have adopted sustainability standards such as the Indonesian Sustainable Palm Oil (ISPO) and the Roundtable on Sustainable Palm Oil (RSPO), sustainability reporting and its impact on share value is still an area that needs to be explored more deeply (Aisyah *et al*., 2024; Centre Ministry of Agriculture *et al*., 2015). There is a phenomenon where even though companies invest in sustainability practices and report on them, the impact on share value is not always consistent and significant (Hahn *et al*., 2015; Putri & Indriani, 2024).

Previous studies have discussed in depth the various variables that contribute to firm value and profits. For example, a study by (Suroto & Setiadi, 2019), showed that the implementation of Good Corporate Governance (GCG) and firm size have a significant influence on profits, which indirectly also affects investors' perception of share value. This is in line with research (Purnamasari & Fauziah, 2022) which found that firm size, capital structure, and dividend policy are key factors affecting firm value, even in challenging economic conditions such as during the COVID-19 pandemic. In addition, the economic sustainability of companies is also influenced by other internal and external factors. Aspects of human capital and innovation capabilities, for example, are crucial elements in improving business performance (Alaoui *et al*., 2022). (Linda Sutanto *et al*., 2023) explain that human capital readiness can have a positive impact on firm performance, with innovation capability acting as a mediating variable. On the other hand, the policy environment also plays an important role. (Indira *et al*., 2023) highlighted how government policies can moderate the effect of intellectual capital on firm performance, especially in Micro, Small, and Medium Enterprises (MSMEs). Meanwhile, complex accounting issues such as transfer pricing can also affect the financial health of firms (Evi, 2023). Previous research has investigated the relationship between sustainability and stock value, finding that sustainability reports and stakeholder engagement have a positive influence on firm value in Indonesia. However, these studies often utilise a more general approach and do not specifically focus on the FAO's SAFA framework. The SAFA framework has been used to assess sustainability in various agricultural sectors, including the plantation sector (Gayatri & Vaarst, 2020; Soldi *et al*., 2019; Suarsa *et al*., 2024).

There are several research gaps underlying this study. The empirical gap can be seen in the extensive use of partial sustainability indicators, such as environmental disclosure or green investment, whereas the SAFA framework offers a more comprehensive approach with four dimensions (Heredia-R *et al*., 2022). In addition, inconsistent findings from previous studies on the relationship between sustainability and stock value require further research to provide stronger evidence (Margolis *et al*., 2009; Orlitzky *et al*., 2003). Another gap is that the focus of research is still limited to the plantation sector in Indonesia, although the plantation sector is important to the Indonesian economy (Safitri *et al*., 2024) , research specifically linking the implementation of the SAFA framework with share value in this sector is still limited (Saragih *et al*., 2020). In terms of methodological gaps, this study will use archival data from the financial and sustainability reports of plantation companies listed on the IDX to quantitatively analyse the impact of SAFA's economic dimension sustainability indicators on stock value (Malahati *et al*., 2023). This approach differs from some previous approaches that use qualitative approaches or case studies (Aisyah, 2024).

Therefore, studies that explicitly analyse the impact of the SAFA framework on the share value of plantation companies on the Indonesia Stock Exchange (IDX) are still rare, especially in the context of the Indonesian capital market. Most studies on SAFA focus more on the sustainability assessment itself, rather than its impact on stock market performance (Rahmatullah *et al*., 2024; Romadhona *et al*., 2024). Academically, this research is important as it will fill the knowledge gap on how the implementation of a comprehensive sustainability framework, such as SAFA, actually impacts economic value for shareholders (Freeman *et al*., 2020; Wood, 1991). This research will contribute to the existing literature on the relationship between sustainability and financial performance, by providing empirical evidence from the plantation sector in Indonesia.

The SAFA framework developed by FAO offers a holistic approach to assessing the economic sustainability of an enterprise, including aspects of, vulnerability, product quality, and contribution to the local economy (Fao, 2017). The SAFA framework provides an international reference tool for assessing the sustainability of agri-food businesses, and its objective is to support the implementation of sustainable policies and effective management in the agricultural sector (Cammarata *et al*., 2021). Previous studies have mostly discussed the application of SAFA in environmental and social aspects (Gayatri & Vaarst, 2020), but none have empirically examined the relationship with financial outcomes such as stock value, especially in the plantation sector listed on the Indonesia Stock Exchange (IDX).

Based on this background, this study aims to provide empirical evidence to reduce the inconsistent findings of previous studies (Orlitzky *et al*., 2003), as well as analyse the effect of the economic dimensions of the SAFA framework on the stock value of plantation companies listed on the IDX during 2022 and 2023. Using a mixed-methods approach and quantitative Generalised Estimating Equation (GEE) analysis to capture time dynamics and correlations between observations, this study

aims to make empirical and methodological contributions to the corporate sustainability literature. In addition, the findings of this study are expected to provide practical implications for stakeholders, including regulators, investors, and industry players, in assessing the relevance of economic sustainability to capital market performance.

The contribution of this research is expected to be significant, both theoretically and practically. Theoretically, this study will add to the theoretical understanding of the relationship between sustainability as measured by the SAFA framework and stock value, particularly in the context of the Indonesian capital market (Boiral *et al*., 2018; Freeman *et al*., 2020). Practically, the results of this study will provide insights for policymakers, investors, and company management regarding the importance of integrating comprehensive sustainability practices to increase stock value (KPMG, 2020).

METHODS

This research uses a *mixed methods* design, with a quantitative approach as the main method and qualitative as a complementary method. The quantitative approach was used to analyse the effect of economic indicators in the *Sustainability Assessment of Food and Agriculture* (SAFA) framework on the stock value of plantation companies listed on the Indonesia Stock Exchange (IDX). The SAFA method allows a comprehensive and integrated assessment of various aspects of sustainability, thus identifying areas that need to be improved and strengthened (Suarsa *et al*., 2024).

Meanwhile, the qualitative approach aims to deepen and provide additional context to the quantitative results through literature review and documentation related to the company's sustainability practices (Malahati *et al*., 2023). The research method in this study aims to assess environmental sustainability indicators in plantations using the Sustainability Assessment of Food Agriculture framework (Phoungthong *et al*., 2021).

The object of this research is companies in the plantation sector that are actively listed on the Indonesia Stock Exchange (IDX) in 2022 and 2023. The population in this study includes all companies included in the sector, while the sampling technique used is purposive sampling (Istiani Istiani & Amri Amrulloh, 2024). Selection criteria include companies that have annual reports and/or sustainability reports that are publicly accessible, and have stock value data available for two years of observation.

As this research is based on secondary data, there is no process of recruiting respondents. The data used was collected from official documents such as company annual reports, sustainability reports, the Indonesia Stock Exchange website, scientific journals, and other relevant institutional publications. Data collection techniques were conducted through documentation studies, which allowed researchers to access historical and contextual data relevant to the research variables.

The measurement of variables in this study refers to the economic indicators in the SAFA framework which consists of several subdimensions, namely: Investment, Vulnerability, Product Quality and Information, and Local Economy. Each subdimension is operationalised into a quantitative score based on the content and indicators contained in the company's report. The dependent variable is the value of the company's shares, represented by the annual *closing price*.

To test the hypothesis, this study uses the Generalised Estimating Equation (GEE) statistical analysis method. This model was chosen because it is able to accommodate the panel data structure (longitudinal), where there is intra-subject correlation (the same company is observed in two time periods). GEE allows for efficient and robust parameter estimation, even when the correlation structure between time periods is not fully known.

The GEE regression model in this study is formulated as follows:

E(Yit)=β0+β1X1,it+β2X2,it+β3X3,it+β4X4,it+εitE(Y_{it}) = \beta_0 + \beta_1X_{1,it} + \beta_2X_{2,it} + \beta_3X_{3,it} + \beta_4X_{4,it} + \varepsilon_{it}E(Yit)=β0+β1X1,it+β2X2,it+β3X3,it+β4X4,it+εit

where E(Yit)E(Y_{it})E(Yit) is the expected stock value of firm *i* at time *t*, β0\beta_0 β0 is a constant, β1\beta_1 β1 to β4\beta_4 β4 are the regression coefficients of each economic indicator, X1,itX_{1,it}X1,it to X4,itX_{4,it}X4,it are the economic SAFA indicator scores, and εit\varepsilon_{it}εit is the error component.

This methodological approach is expected to provide a comprehensive and data-driven picture of the relationship between plantation companies' economic sustainability practices and the capital market's response to them.

Independent Variable (x): Economic Dimensions of the SAFA Framework

Data for the independent variables were collected through content analysis of company reports. Each disclosure item relevant to the SAFA indicators is scored. This study uses a dichotomous scoring method: a score of 1 is given if the company discloses the item, and a score of 0 if there is no disclosure. The total score for each variable is calculated based on the sum of the scores of the relevant indicator items, as presented in Table 1.

[Table 1 about here.]

Dependent Variable (Y): Share Value

This study uses stock value as the dependent variable, which is measured based on the closing stock value at the end of the financial year (31 December) for the period 2022 and 2023. The closing stock values for each year are presented in Table 2.

[Table 2 about here.]

RESULTS AND DISCUSSION

Continuous Variable Information

[Table 3 about here.]

Table 3 displays descriptive statistics for the dependent variable and all covariates.

Share Value: This dependent variable has a mean of 0.35 with a standard deviation of 0.483. Values range from 0 to 1.

Investment (SAFA_IN): The average investment is 0.97 with a standard deviation of 0.158. The range of values is between 0 and 1.

Vulnerability (SAFA_VU): The mean vulnerability is 0.95 with a standard deviation of 0.221. The range of values is between 0 and 1.

Product Quality Information (SAFA_PQI): The mean product quality information is 0.85 with a standard deviation of 0.362. The range of values is between 0 and 1.

Local Economy (SAFA_LE): The mean of the local economy is 0.92 with a standard deviation of 0.267. The range of values is between 0 and 1.

Model Effect Test

[Table 4 about here.]

Table 4 shows the Wald Chi-Square test results for each effect in the model, which tests whether each predictor variable significantly affects the dependent variable "Share Value".

(Intercept): Sig. = 0,110. Since 0.110 > 0.05, the intercept is not statistically significant.

Investment: Sig. = 0,490. Since 0.490 > 0.05, Investment has no statistically significant effect on Share Value.

Vulnerability: Sig. = 0.179. Since 0.179 > 0.05, vulnerability does not have a statistically significant effect on Share Value.

Product Quality Information: Sig. = 0,637. Since 0.637 > 0.05, Product Quality Information has no statistically significant effect on Share Value.

Local Economy: Sig. = 0.977. Since 0.977 > 0.05, Local Economy has no statistically significant effect on Share Value.

Parameter Approximation

[Table 5 about here.]

Table 5 displays the regression coefficients (B), standard errors (Std. Error), Wald 95% confidence intervals, and hypothesis test results for each parameter (variable names in the model including the intercept) in the "Share Value" model.

(Intercept): A value of 0.415 is the expected value of Share Value when all predictor variables (Investment, Vulnerability, Product Quality Information, Local Economy) are zero.

Investment: Coefficient 0.080. This means that, controlling for other variables, every one unit increase in Investment is expected to increase Share Value by 0.080 units.

Vulnerability: This means that, controlling for other variables, every one unit increase in Vulnerability is expected to decrease Stock Value by 0.101 units.

Product Quality Information: Coefficient -0.061. This means that, controlling for other variables, each one unit increase in Product Quality Information is expected to decrease Share Value by 0.061 units.

Local Economy: Coefficient 0.005. This means that, controlling for other variables, every one unit increase in Local Economy is expected to increase Stock Value by 0.005 units.

DISCUSSION

Sample Characteristics

This study involved 20 plantation companies listed on the Indonesia Stock Exchange in 2022 and 2023. Of the total sample, 12 companies showed an increase in share value, while 8 companies experienced a decline. This pattern reflects the diverse market dynamics in the plantation sector, with some companies successfully maintaining or increasing their share value, while others face value pressures. This information provides context before an in-depth analysis is conducted.

Analysis Results and Hypothesis Testing

The research hypothesis is stated as follows:

H1: Investment has a positive impact on stock value.

H2: Vulnerability affects stock value.

H3: Product quality has an impact on stock value.

H4: Local economy affects stock value.

Analysis using Generalised Estimating Equations (GEE) showed that none of the hypotheses were significantly supported (p > 0.05). Hypothesis testing decision making is done by eliminating H0 if the p value is <0.05. These results indicate that the economic dimension of the SAFA framework does not have a significant influence on the stock value of plantation companies.

Descriptive Statistics and Interpretation

The average investment of 0.97 indicates a relatively consistent level of investment disclosure across companies. However, the high variability (large standard deviation) in Product Quality suggests significant differences in sustainability practices between companies. Displaying the data with bar charts or box plots will make this distribution and variation clear to the reader.

Interpretation of results and practical implications

Investment

The results show that investment has no significant impact on stock value. Although investment is generally considered crucial for company growth and attracting investors, in this study, the contribution of investment to stock value is only 0.080 units and not statistically significant ( ). This may indicate that the type or scale of investment made by companies may not be directly reflected in the movement of stocks during the study period, or that other factors may be more dominant in influencing stock value.

Vulnerability

The Vulnerability variable also does not show a statistically significant effect on stock value. The negative coefficient of -0.101 indicates that an increase in vulnerability is expected to decrease stock value. However, this non-significant result may suggest that the stock market may not have fully considered the risks and uncertainties faced by plantation companies, or that companies have implemented fairly effective risk management strategies, thus minimising the impact on stock value. Vulnerability in the SAFA reflects the level of exposure to risk and uncertainty.

Quality & Product Information

This variable also does not show a significant effect on stock value. The negative coefficient of -0.061 indicates that an increase in Product Quality & Information is actually expected to decrease share value. This may suggest that while product quality and information transparency are important for sustainability (in line with the SAFA framework which encourages transparency in sustainability reporting), their impact is more related to long-term reputation and consumer loyalty than directly reflected in short-term share value. The market may consider the value of Product Quality & Information in determining share value.

Local Economy

Similar to the other variables, the Local Economy variable also does not show a statistically significant effect on stock value. Although there is a positive coefficient of 0.005, which indicates that an increase in Local Economy is expected to slightly increase stock value, the effect is still very small and insignificant. This suggests that the company's contribution to local economic development, such as value creation and local purchasing, may not be directly or significantly valued by the capital market in determining stock value during the observed period.

Overall, the results of this study indicate that the economic dimension of the SAFA framework, based on the indicators measured in this study, has no significant influence on the share price of plantation companies listed on the IDX in 2022 and 2023. Although no significant effect of the economic dimension of SAFA on share value was found, this finding needs to be attributed to the context of the Indonesian stock market, which tends to focus on short-term performance. In addition, sustainability disclosures have not been fully factored into investors' judgements, so the impact on share prices has not been evident. This highlights the need to raise awareness and integrate sustainability practices in financial analyses.

Comparison with Previous Research

This finding is contrary to several international studies that show a positive relationship between economic sustainability practices and corporate value. This difference may be due to the different capital market context and the level of investor acceptance of sustainability disclosures in Indonesia. This study provides additional insights into the application of SAFA in the context of emerging markets.

CONCLUSIONS

This study aims to analyse the effect of economic sustainability aspects based on the Sustainability Assessment of Food and Agriculture (SAFA) framework on the stock value of plantation companies listed on the Indonesia Stock Exchange in 2022 and 2023. Using the Generalised Estimating Equations (GEE) method, the results of the analysis show that none of the economic dimensions of SAFA, namely Investment, Vulnerability, Product Quality & Information, and Local Economy, have a statistically significant influence on the value of company shares. While there are descriptively positive coefficients on the Investment and Local Economy dimensions, and negative coefficients on Vulnerability and Product & Information Quality, these effects are not strong enough to be considered significant at the usual confidence level.

This insignificant finding suggests that during the period of analysis in the Indonesian capital market, investors may not have fully integrated or paid significant attention to SAFA-based economic sustainability disclosures in their investment decision-making. This suggests that other factors, such as short-term financial performance, macroeconomic conditions, or market sentiment, may have a greater influence on the value of stocks in the plantation sector. Therefore, the economic dimension of the SAFA framework, as measured in this study, does not directly support increased share value. This finding is in contrast to several international studies that show a positive relationship between economic sustainability practices and corporate value, but is consistent with the view that sustainability disclosure in emerging markets is unlikely to be a major factor in investor judgement.

Theoretically, this study contributes by examining the applicability of the SAFA framework in the context of capital markets, especially in developing countries such as Indonesia. Based on signalling theory, this insignificant result challenges the notion that sustainability disclosures, especially in the economic dimension of SAFA, automatically serve as a strong signal and are trusted by investors so as to influence stock value. Instead, it suggests that sustainability signals are not fully responded to or understood by the market, or that there may be other factors, both mediating and moderating, that influence the relationship that have not yet been identified.

This study enriches the understanding of the use of the SAFA framework in finance by showing that while SAFA is a comprehensive sustainability assessment tool, the direct relevance of the economic dimension to stock value may vary depending on market conditions and investors' level of understanding of sustainability information. These findings emphasise the need

for further research to uncover the mechanisms through which sustainability information can influence financial performance, especially in emerging markets, as well as whether other SAFA dimensions such as social or environmental have a more significant impact. In addition, this study emphasises that companies' implementation of the " " sustainability framework may not be fully appreciated by capital markets, making it important to increase awareness and education for investors on the long-term value of sustainability.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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LIST OF TABLE

1. Dimensions of Economic Resilience in the SAFA Framework 392
2. Stock Value Comparison 393
3. Continuous Variable Information 394
4. Model Effect Test 395
5. Forecast Parameters 396

***Table 1** / Dimensions of Economic Resilience in the SAFA Framework*

Theme	Description	Indicators
Investment	In SAFA, the term Investment is seen from a microeconomic perspective, which is investing in something, such as capital goods, human resources, or ecosystems, with the aim of generating profits.	*Internal Investment* *Community Investment* *Long-term Investment* *Advantages*
Vulnerability	Vulnerability relates to the exposure, sensitivity and adaptability of human and natural systems. As such, vulnerability includes the level of exposure to risk (hazards, shocks) and uncertainty, as well as risk.	*Production stability* *Supply Stability* *Market Stability* *Liquidity* *Risk Management*
Product Quality & Information	Product quality is the overall features and characteristics of a product relating to its ability to fulfil stated or implied needs.	*Food Safety* *Food Quality* *Product Information*
Local Economy	Local Economy in SAFA is considered from the perspective of the company and its contribution to the development of the local economy.	*Value Creation* *Local Purchases*

Source: (Fao, 2014)

***Table 2** / Stock Value Comparison*

No.	Code	Stock Value (2022)			Stock Value (2023)		
		2021	2022	Add	2022	2023	Add
1	ANJT	990	665	-33%	665	745	12
2	CSRA	500	570	14%	570	472	-17%
3	DSNG	500	600	20	600	555	-8%
4	FAPA	3.210	4.300	34	4.300	5.300	23
5	FISH	7.650	6.750	-12	6.750	5.525	-18%
6	LISP	1.185	1.015	-14	1.015	890	-12%
7	MGRO	850	845	-1%	845	705	-17%
8	SGRO	1.995	2.100	5	2.100	2.010	-4%
9	PGUN	388	805	107%	805	416	-48%
10	PSGO	216	146	-32%	146	133	-9%
11	SIMP	456	414	-9%	414	376	-9%
12	NARROW	4.360	4.950	14	4.950	4.000	-19%
13	SSMS	965	1.540	60	1.540	1.470	-5%
14	UNSP	109	128	17	128	113	-12%
15	WAPO	185	250	35	250	91	-64%
16	TBLA	785	686	-13%	686	695	1%
17	PNGO	1.555	1.400	-10%	1.400	1.400	0
18	JAWA	50	50	0	50	50	0
19	AALI	9.500	8.025	-16	8.025	7.025	-12%
20	BISI	995	1.600	61	1.600	1.600	0

***Table 3** / Continuous Variable Information*

Continuous Variable Information

		N	Minimum	Maximum	Average	Deviation
Stock Value Dependent Variable		40	0	1	0	0
Covariates	Investment	40	0	1	0,97	0,158
	Vulnerability	40	0	1	0,95	0,221
	Product Quality Information	40	0	1	0,85	0,362
	Local Economy	40	0	1	0,92	0,267

***Table 4** / Model Effect Test*

Model Effect Test

Source	Type III Chi-Square Wald test	De-grees of Free-dom	Yourself.
(Intercept)	2.549	1	.110
Investment	.476	1	.490
Vulnerability	1.809	1	.179
Product Quality Information	.223	1	.637
Local Economy	.001	1	.977

***Table 5** / Forecast Parameters*

Estimated Parameters

Parameters	B	Standard Error	Wald 95% Confidence Interval		Hypothesis Test		
			Bottom	Above	Chi-Square Wald	df	Your-self.
(Intercept)	.415	.259	-.094	0,924	2.549	1	.110
Investment	.080	.1156	-.147	.306	.476	1	.490
Vulnerability	-.101	0,0751	-0,248	0,046	1.809	1	.179
Product Quality Information	-0,061	.1285	-.313	.191	.223	1	.637
Local Economy	.005	.1900	-.367	.378	0,001	1	0,977
(Scale)	.259						