

ENVIRONMENTAL COST, INTELLECTUAL CAPITAL AND COMPANY SIZE AS PREDICTOR OF COMPANIES FINANCIAL PERFORMANCE

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Abstract

This study aims to analyze the effect of environmental cost, intellectual capital, and company size on financial performance as measured by return on assets (ROA). The important role of the palm oil industry in Indonesia, issues concerning the sustainability of this industry, and the instability of average ROA over the past five years form the background for this study. The sample data collection used a purposive sampling method to obtain 11 palm oil plantation companies listed on the Indonesia Stock Exchange (IDX) for the period of 5 years from 2019 to 2023. The analytical technique used in this study is panel data regression with a common effect model approach. This study used the Econometric Views (Eviews) version 12 software as the analytical tool. The results of this study indicate that environmental cost has no effect on ROA, intellectual capital has a positive effect on ROA, and company size has no effect on ROA. Simultaneously, environmental cost, intellectual capital, and company size affect ROA.

Keywords: environmental cost, intellectual capital, company size, financial performance (ROA)

I. INTRODUCTION

The palm oil plantation sector is one of Indonesia's key industrial sectors, playing a significant role in the economy, food security, job creation, and contributions to international trade. Badan Riset dan Inovasi Nasional (BRIN), the National Research and Innovation Agency of Indonesia, states that Indonesia is one of the world's largest producers and suppliers of crude palm oil (CPO). This palm oil commodity contributes significantly, accounting for 73.83% of Indonesia's total value of agricultural exports (BRIN Public Relations, 2024).

Despite its important role, this industrial sector still faces challenges in terms of environmental management, particularly sustainable palm oil industry governance. Abidin (2023) states that issues such as deforestation, land fires, and land tenure legality remain key obstacles hindering the industry from achieving sustainability. These environmental challenges require greater focus as they have become critical issues recognized by investors.

Another challenge faced by the palm oil plantation industry is financial performance. One ratio that can indicate a company's financial performance is its ability to generate profits, calculated by the profitability ratio. As shown in Table 1 below, profitability, which in this study was calculated using return on assets (ROA) in palm oil plantation companies over the past five years, shows significant fluctuations.

Table 1. Average ROA of Palm Oil Plantation Companies Listed on the IDX in 2019-2023

Year	Average of ROA
2019	-6,04%
2020	1,98%
2021	5,26%
2022	5,75%
2023	-1,28%

Source: data processed by the author (2025)

The environmental cost is believed to be causing these fluctuations in ROA. The public and investors expect companies to be more responsible regarding the environment. Companies should prioritize business by focusing not only on the financial aspect but also on the non-financial aspect, as well as the short-term and long-term impacts on the environment caused by their activities. In addition, intellectual capital is also believed to affect ROA in this industry. In today's business environment, intangible assets such as intellectual capital have become highly valuable and essential assets that every company should own and leverage to add value, thereby increasing ROA. Another factor that can affect the value of ROA is company size. A large total asset indicates that a company is relatively stable in its operations and has a greater ability to generate profits (Mauhibah & Anna, 2024). Therefore, investors are more likely to trust larger companies.

Given the importance of this topic, the research gaps in previous studies, and the limited research conducted on palm oil plantations companies, the author is interested in conducting research titled "Environmental Cost, Intellectual Capital, and Company Size as Predictor of Companies Financial Performance".

2. LITERATURE REVIEW

Legitimacy Theory

Anggraini et al. (2024) state that the legitimacy theory focuses on everything related to society and companies. By this legitimacy theory, companies must ensure that their activities align with social norms so that all parties accept all their activities (Maesaroh et al., 2022). Gaining trust from the community will enhance the company's reputation and likely increase profits.

One way to gain legitimacy from the community is to be responsible for the environmental impacts. This can be shown through sustainability reports or annual reports. By showing concern for the environment, the

company will be seen as legitimate and acceptable to the community (Ernawati, 2023).

Stakeholder Theory

This is the theory that prioritizes stakeholders. Therefore, companies not only focus on their own interests by maximizing profits, but also consider stakeholders' interests when conducting their business. Suryaningrum & Ratnawati (2024) explain that in stakeholder theory, businesses do not only focus on their operations, but also on the reciprocal relationships built by the business and the advantages for stakeholders.

Management must be transparent with stakeholders about company performance information. Company performance is obtained through financial reports, annual reports, and sustainability reports. Stakeholders who recognize the importance of sustainable business naturally want companies to conduct their business while considering environmental impacts. Environmental information disclosure is part of their efforts to account for their performance to stakeholders (Ramadhana & Setiawan, 2024).

Resource-Based View Theory

According to David & David (2015), the resource-based view theory is a theory that believes that, compared to external resources, internal resources are a far more important factor for companies to possess in order to achieve and maintain competitive advantage. The level of a company's competitive ability can be determined by how the company accesses, controls, and manages its resources (Lubis, 2023). Intellectual capital and company size are variables that originate from internal resources. Since this theory emphasizes internal resources, these two variables are suitable for association with this theory.

Return on Assets (ROA)

Nafiroh & Nahumury (2016) in Yusniawati & Romdioni (2024) explain that ROA can be described as a measuring tool to determine how much profit a business unit can generate from its

total assets. In other words, this ratio shows how effectively and efficiently a company's assets help generate net profit. Therefore, the higher the ROA obtained, the higher the effectiveness and efficiency of a company in terms of asset utilization, not only physical assets but also non-physical assets (Yusniawati & Romdioni, 2024). ROA is calculated by dividing net profit by the company's total assets.

Environmental Cost

Environmental cost are costs incurred by companies as a result of environmental degradation or because their operational activities may worsen environmental conditions (Hansen & Mowen, 2013) in (Anggraini et al., 2024). According to Mauhibah & Anna (2024), environmental cost can be defined as costs allocated and incurred by businesses, whether resulting from environmental damage or protective measures taken by the business. In calculating a company's environmental cost, Babalola (2012) in Fitriani (2013) explains that this cost can be calculated by dividing the cost incurred by the company in its corporate social responsibility (CSR) activities by its net profit.

Intellectual Capital

According to Rahmadi & Mutasowifin (2021) in Agustina & Effendy (2024), intellectual capital is a concept that describes intangible assets that serve as new knowledge-based resources, and if companies utilize them optimally, their strategies can be implemented more effectively and efficiently through the impetus provided by these assets. Agustina & Effendy (2024) add that this unique resource can create a competitive advantage for companies, thereby improving their performance. Intellectual capital is an important component for the prosperity, growth, and development of companies in the current era of a knowledge-based economy (Baroroh, 2013) in (Rahmawati, 2023). Intellectual capital can be calculated using the method developed by Pulic, namely the value-added intellectual coefficient (VAICTM) method, by summing the value-added capital employed (VACA), value-added

human capital (VAHU), and structural capital value-added (STVA).

Company Size

According to Yunus & Tarigan (2020), Company size is a scale used to classify how large or small a company is based on its assets. This scale is one of the considerations for investors in making investment decisions and one of the factors for successfully obtaining funding from creditors. This is because larger companies are considered more capable of competing and surviving within their industry (Sugiono & Christiawan, 2013) in (Meiyana & Aisyah, 2019). Dharmawan et al. (2024) state that company size can be calculated by the natural logarithm (Ln) of the assets owned by the company.

3. METHODS

The design of this study is causal comparative because it aims to determine the cause-and-effect relationship. This study uses three independent variables, namely environmental cost, intellectual capital, and company size, and one dependent variable, ROA, which describes financial performance. The unit of analysis used in this study is palm oil plantation companies listed on the IDX from 2019 to 2023. The researcher used purposive sampling to determine the research sample. The type of data used in this study is quantitative data. The research data was obtained from published documents and is therefore classified as secondary data, which refers to data obtained from indirect sources, such as other people or documents (Sugiyono, 2017). The documentation method was used during this research by reviewing financial reports, annual reports, and sustainability reports from 2019 to 2023 available on the IDX website and each sample company's website.

The data used in this study combines cross-sectional and time series data, so panel data regression analysis was used as the data analysis method with Econometric Views (Eviews) as the analysis tool. The analysis conducted on the

research data includes descriptive statistical analysis, determination of the best model, classical assumption tests (multicollinearity test, heteroscedasticity test, and autocorrelation test), partial test (t-test), simultaneous test (F-test), and analysis of the coefficient of determination. The researcher did not perform normality tests based on the central limit theorem (CLT). According to the central limit theorem, the distribution is considered normal if the sample size is 30 (minimum) (Kwak & Kim, 2017). This theory states that in most distributions, whether normal or non-normal, the distribution of the sample mean will approach normality as the sample size increases (Hays, 1994) in (Islam, 2018).

4. RESULTS AND DISCUSSION

Sample Companies

A purposive sampling technique was used to determine the sample companies in this study. 18 palm oil plantation companies listed on the IDX during 2019-2023 and not delisted were included in the population. Of these, 11 companies met the criteria for the 5-year period, resulting in a total of 55 observations.

Descriptive Statistical Analysis

Descriptive statistical analysis was conducted with the aim of describing or illustrating the research data without producing general conclusions. Table 2 shows the results of the descriptive statistical analysis which are:

- 1) The ROA in the companies sampled in this study has a minimum value of -0.582530, which is the 2019 ROA of PT Bakrie Sumatera Plantation Tbk. In addition, this variable has a maximum value of 1.033660, which is the 2022 ROA of PT Eagle High Plantations Tbk. The average ROA is 0.011562 and the standard deviation is 0.180146.

Table 2. Results of the Descriptive Statistical Analysis

	ENVIRONMENTAL_COST	INTELLECTUAL_CAPITAL	COMPANY_SIZE	ROA
Mean	0.041852	3.041471	29.48117	0.01151
Median	0.005980	3.033240	29.90843	0.0157
Maximum	1.099160	12.71317	31.38289	1.03361
Minimum	-0.145980	-11.65234	26.65852	-0.5825
Std. Dev.	0.161710	3.955763	1.240175	0.1801
Skewness	5.378889	-0.716024	-0.666602	2.64661
Kurtosis	34.85190	6.037472	2.670571	22.0211
Jarque-Bera	2590.209	25.84312	4.321983	893.411
Probability	0.000000	0.000002	0.115211	0.00001
Sum	2.301880	167.2809	1621.464	0.6359
Sum Sq. Dev.	1.412114	844.9954	83.05386	1.7524
Observations	55	55	55	55

Source: data processed using Eviews 12 (2025)

- 2) The environmental cost for the companies sampled in this study has a minimum value of -0.145980, which is the 2021 environmental cost of PT Andira Agro Tbk. Additionally, this variable has a maximum value of 1.099160, which is the 2019 environmental cost of PT Sawit Sumbermas Sarana Tbk. The average environmental cost is 0.041852, and the standard deviation is 0.161710.
- 3) The intellectual capital in the companies sampled in this study has a minimum value of -11.65234, which is the intellectual capital for 2019 from PT Gozco Plantation Tbk. Additionally, this variable has a maximum value of 12.71317, which is the intellectual capital for 2021 from PT Sampoerna Agro Tbk. The average intellectual capital is 3.041471 with a standard deviation of 3.955763.
- 4) The company size in the companies sampled in this study has a minimum value of 26.65852, which is the company size in 2023 of PT Andira Agro Tbk. Additionally, this variable has a maximum value of 31.38289, which is the company size in 2022 of PT Sinar Mas Agro Resources and Technology Tbk. The average company size is 29.48117 and the standard deviation is 1.240175.

Determination of The Best Model

The determination of the most suitable model was conducted using the chow test, hausman test, and lagrange multiplier (LM) test. Table 3 shows the results of the Chow test that the probability of cross-section F is 0.4948, exceeding the significance threshold of 0.05. Therefore, in determining the best model

between the two models through the chow test, the common effect model (CEM) can be said to be better than the fixed effect model (FEM). With this result, the hausman test is unnecessary, and the lagrange multiplier (LM) test can be performed directly. Table 4 shows the results of the lagrange multiplier (LM) test.

Table 3. Results of the Chow Test

Redundant Fixed Effects Tests			
Equation: MODEL_FEM			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.956012	(10,41)	0.4948
Cross-section Chi-square	11.527512	10	0.3179

Source: data processed using Eviews 12 (2025)

The test results shown in Table 4 show that the Both value of Breusch-Pagan is 0.3452, exceeding the significance threshold of 0.05. Therefore, in determining the best approach model between the two models through the LM test, the common effect model (CEM) can be said to be better than the random effect model (REM). Thus, based on the two tests conducted, the best model to use in this study is the common effect model (CEM).

Table 4. Results of the Lagrange Multiplier (LM) Test

Lagrange Multiplier Tests for Random Effects			
Null hypotheses: No effects			
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives			
	Cross-section	Time	Both
Breusch-Pagan	0.550590 (0.4581)	0.340308 (0.5597)	0.890898 (0.3452)

Source: data processed using Eviews 12 (2025)

Multicollinearity Test

This test was conducted with the expectation that the regression model used in this study would not show multicollinearity. In other words, there was no correlation or relationship between the independent variables. Table 5 shows the results of the variance inflation factor (VIF) calculation to determine multicollinearity.

Based on the test results shown in Table 5, the centered VIF for the environmental cost shows a value of 1.019371, the intellectual capital

centered VIF is 1.198281, and the company size centered VIF is 1.214029. All these values are less than 10.

Table 5. Results of the Variance Inflation Factor (VIF) Calculation

Variance Inflation Factors
Date: 07/06/25 Time: 23:45
Sample: 1 55
Included observations: 55

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.348129	680.4309	NA
ENVIRONMENTAL...	0.020313	1.088916	1.019371
INTELLECTUAL C...	3.99E-05	1.919777	1.198281
COMPANY SIZE	0.000411	699.9635	1.214029

Source: data processed using Eviews 12 (2025)

The tolerance (TOL) is not provided directly in the Eviews application, so its value must be determined manually. The TOL value can be calculated using the formula $1/\text{VIF}$, and the results are presented in Table 6.

Table 6. Results of Tolerance (TOL) Calculation

Variabel	VIF	TOL (1/VIF)
Biaya Lingkungan	1.019371	0.980997
Intellectual Capital	1.198281	0.834529
Ukuran Perusahaan	1.214029	0.823704

by the author (2025)

Source: data processed

Table 6 shows the TOL values for the environmental cost at 0.980997, the intellectual capital at 0.834529, and the company size at 0.823704. All three independent variables show TOL values exceeding 0.10. With VIF values less than 10 and TOL values exceeding 0.10, this proves that the regression model in this study does not show multicollinearity.

Heteroscedasticity Test

The second classical assumption test was conducted to prove whether there were unequal variances of residuals between observations in this regression model. The Glejser test was conducted to test heteroscedasticity, hoping that no heteroscedasticity would be found.

Table 7. Results of the Glejser Test

Heteroskedasticity Test: Glejser
Null hypothesis: Homoskedasticity

F-statistic	1.063212	Prob. F(3,51)	0.3729
Obs*R-squared	3.237334	Prob. Chi-Square(3)	0.3565
Scaled explained SS	6.371338	Prob. Chi-Square(3)	0.0949

Source: data processed using Eviews 12 (2025)

Based on the glejser test that has been conducted with the results shown in Table 7, the probability of chi-square shows a value of 0.3565, which is above the significance threshold of 0.05. This proves that there is no heteroscedasticity in the regression model of this study. In other words, this regression model is homoscedastic, meaning that the residual variance in this study is constant.

Autocorrelation Test

The autocorrelation test can detect correlations between errors in one period and previous periods. The Durbin-watson method was used for the autocorrelation test in this study, hoping that the regression model does not have autocorrelation.

Table 8. Results of the Autocorrelation Test

R-squared	0.181075	Mean dependent var	0.011562
Adjusted R-squared	0.132903	S.D. dependent var	0.180146
S.E. of regression	0.167749	Akaike info criterion	-0.662751
Sum squared resid	1.435123	Schwarz criterion	-0.516763
Log likelihood	22.22566	Hannan-Quinn criter.	-0.606297
F-statistic	3.758928	Durbin-Watson stat	2.283693
Prob(F-statistic)	0.016290		

Source: data processed using Eviews 12 (2025)

Based on the autocorrelation test that has been conducted with the results shown in Table 8, the durbin-watson (DW) value is 2.283693. This value is above the du value obtained from the DW table, which is 1.6815. The DW value is also below the 4-du value of 2.3185. Thus, the DW value falls between the du value and the 4-du value, i.e., $1.6815 < 2.283693 < 2.3185$. From the results of this autocorrelation test, it can be concluded that there is no autocorrelation in the panel data regression of this study.

Estimation and Interpretation of Regression Equation

Based on the determination of the best model tests previously, the common effect model

(CEM) was determined to be the best model, with the regression test results shown in Table 9.

The regression equation formed based on the regression test results shown in Table 9 is as follows:

$$\text{ROA} = -0.286889 + 0.015815 \cdot \text{EC} + 0.018193 \cdot \text{IC} + 0.008224 \cdot \text{CS}$$

Table 9. Results of the Regression Test

Dependent Variable: ROA Method: Panel Least Squares Date: 07/06/25 Time: 23:57 Sample: 2019 2023 Periods included: 5 Cross-sections included: 11 Total panel (balanced) observations: 55				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.286889	0.590025	-0.486232	0.6289
ENVIRONMENTAL COST	0.015815	0.142525	0.110960	0.9121
INTELLECTUAL CAPITAL	0.018193	0.006317	2.879991	0.0058
COMPANY SIZE	0.008224	0.020281	0.405502	0.6868
R-squared	0.181075	Mean dependent var		0.011562
Adjusted R-squared	0.132903	S.D. dependent var		0.180146
S.E. of regression	0.167749	Akaike info criterion		-0.662751
Sum squared resid	1.435123	Schwarz criterion		-0.516763
Log likelihood	22.22566	Hannan-Quinn criter.		-0.606297
F-statistic	3.758928	Durbin-Watson stat		2.283693
Prob(F-statistic)	0.016290			

Source: data processed using Eviews 12 (2025)

The interpretation of the regression equation is as follows:

1. The constant or intercept value of -0.286889 indicates that when all independent variables in the study have a value of 0, ROA will have a value of -0.286889.
2. The regression coefficient value for the environmental cost variable (EC) of 0.015815 indicates that when the environmental cost variable (EC) increases by 1 unit, ROA will increase by 0.015815.
3. The regression coefficient value of the intellectual capital (IC) variable is 0.018193, indicating that when the intellectual capital (IC) variable increases by 1 unit, ROA will increase by 0.018193.
4. The regression coefficient value for the company size (CS) variable is 0.008224, indicating that when the company size (CS) variable increases by 1 unit, ROA will increase by 0.008224.

Partial Test (t Test)

The t test was conducted to determine how the independent variable affected the dependent variable. Table 10 shows the calculated t-value, while the t-table value of 2.007584 was obtained from the t-table with a degree of freedom of 51 and a significance threshold of 0.05.

The t test results in Table 10 can be interpreted as follows:

1. The calculated t-value for the environmental cost is 0.110960 < the table t-value of 2.007584, with a significance level (p-value) of 0.9121 > 0.05. Therefore, it can be interpreted that environmental cost does not affect ROA.
2. The calculated t-value for the intellectual capital is 2.879991 > the table t-value of 2.007584, with a significance level (p-value) of 0.0058 < 0.05. Therefore, it can be concluded that intellectual capital has a positive effect on ROA.
3. The calculated t-value for the company size is 0.405502 < the table t-value of 2.007584, with a significance level (p-value) of 0.6868 > 0.05. Therefore, it can be interpreted that company size does not affect ROA.

Table 10. Results of the t Test

Dependent Variable: ROA Method: Panel Least Squares Date: 07/06/25 Time: 23:57 Sample: 2019 2023 Periods included: 5 Cross-sections included: 11 Total panel (balanced) observations: 55				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.286889	0.590025	-0.486232	0.6289
ENVIRONMENTAL COST	0.015815	0.142525	0.110960	0.9121
INTELLECTUAL CAPITAL	0.018193	0.006317	2.879991	0.0058
COMPANY SIZE	0.008224	0.020281	0.405502	0.6868

Source: data processed using Eviews 12 (2025)

Simultaneous Test (F Test)

The F test was conducted to determine the simultaneous effect of the three independent variables on the dependent variable. Table 11 shows the results of the test.

Table 11. Results of the F Test

R-squared	0.181075	Mean dependent var	0.011562
Adjusted R-squared	0.132903	S.D. dependent var	0.180146
S.E. of regression	0.167749	Akaike info criterion	-0.662751
Sum squared resid	1.435123	Schwarz criterion	-0.516763
Log likelihood	22.22566	Hannan-Quinn criter.	-0.606297
F-statistic	3.758928	Durbin-Watson stat	2.283693
Prob(F-statistic)	0.016290		

Source: data processed using Eviews 12 (2025)

Table 11 shows the F-statistic as F calculated at $3.758928 > F$ table value at 2.786229, with a significance level (p-value) of $0.016290 < 0.05$. Thus, environmental cost, intellectual capital, and company size simultaneously have a significant effect on ROA.

Analysis of the Coefficient of Determination

This analysis was conducted to determine the ability of independent variables in explaining the variation of dependent variables, with the results shown in Table 12.

Table 12. Results of the Analysis of the Coefficient of Determination

R-squared	0.181075	Mean dependent var	0.011562
Adjusted R-squared	0.132903	S.D. dependent var	0.180146
S.E. of regression	0.167749	Akaike info criterion	-0.662751
Sum squared resid	1.435123	Schwarz criterion	-0.516763
Log likelihood	22.22566	Hannan-Quinn criter.	-0.606297
F-statistic	3.758928	Durbin-Watson stat	2.283693
Prob(F-statistic)	0.016290		

Source: data processed using Eviews 12 (2025)

The test results in Table 12 prove that the adjusted R-squared value is 0.132903. This shows that environmental cost, intellectual capital, and company size can explain 13.29% of the variation in the ROA of palm oil plantation companies. Meanwhile, the remaining 86.71% is affected by other variables not included in this study.

5. CONCLUSIONS & SUGGESTIONS

Based on the results of the study described in the previous section, it can be concluded that environmental cost does not affect ROA, intellectual capital has a positive effect on ROA, and company size does not affect ROA. This study proved that high intellectual capital can increase a company's ROA. However, as the environmental cost or company size increases or

decreases, it does not have an effect on the company's ROA.

The limitation of this study was the coefficient of determination of only 13.29%, which means that 86.71% of the variation in ROA is affected by variables outside the scope of this study. Future researchers should expand the study scope, extend the study period, and include more variables in addition to the three variables in this study. Investors and companies are encouraged to focus on intellectual capital, as this study has proven that high intellectual capital can increase a company's ROA. Additionally, policymakers are encouraged to make greater efforts to raise public awareness of the importance of sustainability-focused businesses.

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