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GREEN MSMEs: BUSINESS TRANSFORMATION THROUGH THE CONCEPTS OF ECO-ADOPTER, ECO-ENTREPRENEUR, AND ECO-INNOVATOR ON MSME SUSTAINABILITY

Wiwiek Kusumaning Asmoro[1*], Novie Astuti Setianingsih[2], Eti Putranti[3], Atik Tri Andari[4], Hanifah Puspita Sari[5], Fitria Nur Hamidah[6]

Accounting Department, Politeknik Negeri Malang, Indonesia
wiwiek.kusumaning@polinema.ac.id[1], viecoll77@gmail.com[2],*
eti.putranti@polinema.ac.id[3], atik.tri@polinema.ac.id[4],
hanifah.puspita@polinema.ac.id[5], fidahfnh@gmail.com[6]
**Corresponding author*
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ABSTRACT

A green future calls for joint action, using the Green MSMEs concept as a means to build a healthy, sustainable environment that lives in harmony with nature. The study aimed to assess how the concepts of eco-adopter, eco-entrepreneur, and eco-innovator shape MSME sustainability. Using a probability sampling technique combined with simple random sampling, primary data were collected via a questionnaire. With a population of 75 MSME actors in Kediri City's Tofu Producer Processing sector, the Slovin formula was used to calculate the sample, resulting in 43 MSME respondents from Kediri City. Data were drawn from questionnaires circulated to owners of MSMEs in the Tofu Producer Processing sector registered at the Kediri City Cooperative and SME Trade Office, and analysis was performed with Spearman Rank correlation, Kendall's W, and ordinal regression using SPSS. The findings show that the Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator concepts have a significant effect on MSME sustainability. However, most MSMEs are currently still at the Eco-Adopter stage or only apply basic eco-friendly principles and Pre-Eco-Adopter. This shows a large implementation gap to reach the level of Eco-Entrepreneur and Eco-Innovator which has a deeper and structural sustainability impact. Therefore, the transition of MSMEs to the Eco-Innovator stage requires strong ecosystem support. Factors such as access to Green Financing (especially commercial financing for Eco-Innovators), specific Government Regulations and Incentives for green MSMEs, as well as the adoption of Digital Technologies that facilitate green innovation, are key determinants of the success of the transformation.

Keywords: *Green MSMEs, eco-adopter, eco-entrepreneur, eco-innovator, MSME sustainability.*

INTRODUCTION

A business that implements environmental sustainability can be called a green business. As explained by Marushevskyi and Hickman (2018), a business is considered green when it commits itself to environmental sustainability principles in its operations, working to use renewable resources and to lessen the harmful environmental footprint its activities cause. MSMEs, which are the business actors with the largest number in Indonesia, are part of the business sector that needs to transition its business model toward green practices (Setyaningsih & Arrahman, 2025). Given the emerging challenges of future climate change, the urgency of the role of MSMEs, the eco-wakening phenomenon, and in line with Bank Indonesia's goal of supporting sustainable economic growth, Bank

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Indonesia is seeking to encourage MSMEs to transform into Green MSMEs in order to respond to future business opportunities.

Movement toward a green economy can drive sustainable economic growth while also encouraging business activities oriented toward environmental preservation. However, the implementation of environmentally friendly business practices among MSMEs in Indonesia still faces limitations. Purwandani and Michaud (2021) showed that most MSMEs are still at the non-adoption stage or the early Eco-Adopter stage, so green practices have not been implemented comprehensively. This condition is also supported by research findings showing that more than 80% of MSMEs in Indonesia have not comprehensively adopted green business practices. This shows that there is still an implementation gap in environmentally friendly practices among MSMEs in Indonesia, particularly in waste management, resource efficiency, and the application of technology that supports sustainability.

The Green MSME concept is one solution for achieving sustainable development (Mentari et al., 2024), particularly in addressing environmental problems in tofu processing MSMEs related to waste management and the potential for environmental pollution resulting from the production process. Tofu processing MSMEs are encouraged by this concept to cut down their environmental consequences, boost the resource-use efficiency, along with cultivate more sustainable production practices by putting environmentally friendly business practices into place. This concept encourages MSMEs toward environmental friendliness and is a strategy that MSMEs can adopt to transform into green businesses in order to become competitive and contribute to a sustainable economy. When an MSME commits itself to environmental sustainability standards in all operational processes and strives to use renewable resources while minimizing the adverse environmental consequences of its activities, it qualifies as green. According to Azzahra and Firdaus (2024), the definition of a Green MSME is an MSME that builds its business concept around a green process and green output, dedicates itself to sustainability principles and a circular economic value chain, and seeks to achieve economic, social, and environmental goals. Green practices carried out within the value chain, adapted from the Green MSME concept, form the basis for developing the Green MSME business model (Koirala, 2019). MSMEs carry out green practices that are grouped into three levels, specifically (i) Eco-adopter, (ii) Eco-entrepreneur, and (iii) Eco-innovator. To determine which Green MSME stage applies, various green indicators are evaluated, covering the areas of (i) production, (ii) marketing, (iii) human resources, and (iv) finance. Practically speaking, green indicators can be categorized by whether they are mandatory or complementary in nature.

Referring to these three stages, an MSME can move up from one stage to the next, or move directly to the highest stage if the mandatory indicators for each stage have been fulfilled. The determination of the Green MSME stage cannot be separated from how an MSME is able to implement the indicators from the four aspects that make up the Green MSME business model. In addition, there are complementary indicators that will strengthen a Green MSME's position in implementing environmentally friendly and

inclusive practices.

The progression of a Green MSME's stage does not follow the same time period; it may be shorter or longer. This condition is influenced by the type of sector or subsector and the existing condition of the Green MSME. The Eco-Adopter stage places greater emphasis on practices that are both environmentally friendly and sustainable, being adopted, or is a conversion from non-environmentally friendly (non-organic) to environmentally friendly (organic) practices. At the Eco-Entrepreneur stage, environmentally friendly and sustainable practices have become part of the core of the MSME's business model. This relates to meeting an increasingly broad market demand. Meanwhile, at the Eco-Innovator stage, a Green MSME is able to capture green market opportunities through innovations in various aspects of the business, with an environmentally friendly and sustainable core business model (Syahputra et al., 2024). At this stage, an MSME is expected to be able to access international markets and meet environmentally friendly certification requirements according to the requirements of the destination export country. Below is the roadmap of the development stages of the Green MSME business model.

MSME actors role is now no longer limited to the economy, but has expanded toward the nobler goal of environmental preservation. Preserving the environment and ensuring sustainable development depend heavily on the important role played by MSME actors. Green MSMEs refer to efforts to maintain business balance and continuity using a sustainable approach. This knowledge must be promoted among MSME actors in line with realizing sustainable business. Business sustainability is certainly something that every ongoing company wants to achieve. Business continuity cannot be achieved instantly. Business sustainability is an achievement that requires a process to attain. Business sustainability is a condition for the development and protection of the resources owned by a company, which allows people to find ways to meet present and future needs. Thus, business sustainability is a condition that directs business resilience toward achieving business success in facing competition, as seen from how the business meets its needs (Rosani & Lukiastuti, 2022).

The production stage is a key element in MSMEs. In simple terms, the production process consists of three stages: input, process, and output. In the implementation of Green MSMEs, business actors are expected to become eco-innovators, eco-entrepreneurs, and even eco-adopters in terms of the production aspect. Sumarno et al. (2015) found that MSMEs that adopt environmentally friendly product design gain several benefits, such as environmental preservation achieved through efficient use of raw materials, greater economic worth derived from production waste, and the ability to capture market opportunities created by consumer demand for environmentally friendly products. In line with this, Khairuman et al. (2023) found that the implementation of environmentally friendly production processes in the defense industry has benefits such as production time efficiency, improving the company's image, and reducing negative impacts. Meanwhile, research on sustainable finance defines it as a financial instrument aimed at tackling climate change and its impacts by regulating emissions and encouraging

the development of renewable energy as well as sustainable development that covers environmental, social, and governance responsibility (Valdiansyah & Widiyati, 2024). The implementation of environmentally based finance (Green Accounting) for MSMEs supports investment decision-making that takes environmental, social, and governance impacts into account.

The novel contribution of this study is its broader range of indicators relative to prior work by adding the production, finance, marketing, and human resources aspects. Previous studies only examined the Eco-Innovator concept (Štěrbová et al., 2021), whereas this study looks at it from the perspective of Eco-Entrepreneurs through Eco-Adopters (Munawar et al., 2024), and the aspect indicators examined were limited to the production or financial aspects (Achmad, Yudaruddin, Budiman, et al., 2023; Achmad, Yudaruddin, Nugroho, et al., 2023). In contrast, the aspect indicators examined in this study include not only the production and financial aspects but also the marketing aspect and the human resources aspect. This study aims to analyze the effect of Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator on MSME sustainability by examining these influences both partially and simultaneously.

RESEARCH METHOD

Research Population and Sample

Applying a quantitative research design with a survey approach, this study focuses on a population of 75 businesses operated by MSME actors in the tofu processing industry sector registered at the Kediri City Office of Trade, Cooperatives, and SMEs. Through a random sampling technique, 43 MSMEs in the tofu processing industry were obtained as the sample, giving every member of the population an opportunity to be selected as part of the research sample. Sampling is the method used to draw a sample from a previously known population, both in terms of determining the sample size and the sampling model, with the expectation that the resulting sample can represent the population. The sample obtained was 43 samples from the tofu processing industry. Participants were selected by means of random sampling technique.

Data Collection Procedure

This study uses data that is almost entirely primary data, collected using the survey method. The survey method is a data collection method in which data is gathered using a written list of questions compiled into a questionnaire. The respondents in this study were Tofu Producer Processing MSMEs registered at the Kediri City Office of Trade, Cooperatives, and SMEs. The authors provided several alternative answers that could be selected when filling out the questionnaire, so that respondents only had to choose one of several alternative answers that best described their actual condition.

Operational Definition of Variables

According to Sugiyono (2021), a variable is a phenomenon that becomes the focus of a researcher's observation. A variable is an attribute of a group of people or objects

that varies from one to another within the group. The variables in this study are as follows:

Table 1. Operational Definition of Variables

No	Group	Variable	Indicator	Scale
1	GREEN MSMEs	Eco-Adopter (X1)	Production Aspect	Ordinal
			Marketing Aspect	Ordinal
			Human Resources Aspect	Ordinal
			Finance Aspect	Ordinal
2		Eco-Entrepreneur (X2)	Production Aspect	Ordinal
			Marketing Aspect	Ordinal
			Human Resources Aspect	Ordinal
			Finance Aspect	Ordinal
3		Eco-Innovator (X3)	Production Aspect	Ordinal
			Marketing Aspect	Ordinal
			Human Resources Aspect	Ordinal
			Finance Aspect	Ordinal
4		MSME Business Sustainability (Y)	Production Aspect	Ordinal
			Marketing Aspect	Ordinal
			Human Resources Aspect	Ordinal
			Finance Aspect	Ordinal

Source: Data processed, adapted from Bank Indonesia (2026) and research by Khairuman et al. (2023); Sumarno et al. (2015); and Tjahjadi et al. (2020).

Presented in Table 1 are the operational definitions for the variables used in this research. The table 1 outlines the four variables examined in this study, namely Eco-Adopter (X1), Eco-Entrepreneur (X2), Eco-Innovator (X3), and MSME Business Sustainability (Y), along with their respective indicators across production, marketing, human resources, and finance aspects, as well as the measurement scale used for each indicator.

Data Analysis Technique

The analysis applied in this study covers both descriptive and inferential analysis. The descriptive portion characterizes respondents and the distribution of each research variable, whereas the inferential portion examines the relationship and effect that Eco-Adopter (X1), Eco-Entrepreneur (X2), and Eco-Innovator (X3) have on MSME Sustainability (Y).

Kendall's W tests the degree of concordance of the relationship among the three independent variables and the dependent variable, while Spearman Rank analysis is applied to test the relationship between each independent variable and the dependent variable. Because the research variables are measured on an ordinal scale and the MSME Sustainability variable is categorized into low, medium, and high levels, the effect test was conducted using ordinal regression with the help of SPSS. Ordinal regression serves to identify the effect of Eco-Adopter (X1), Eco-Entrepreneur (X2), and Eco-Innovator (X3) on the level of MSME Sustainability (Y), both individually and simultaneously.

RESULTS AND DISCUSSION

Results

Data Analysis

Respondent Characteristics

Covered in Table 2 are the characteristics of the 43 respondents, namely gender, age, educational background, and length of business operation. These characteristics provide an overview of the respondents' demographic profiles and business experience.

Table 2. Respondent Characteristics

Characteristic	Characteristic	Frequency	Percentage
Gender	Male	22	51.20%
	Female	21	48.80%
Total		43	100%
Age	18–30 years	13	30.30%
	31–50 years	18	41.80%
	>50 years	12	27.90%
Total		43	100%
Education	Elementary/Junior High School	4	9.40%
	Senior High School	26	60.40%
	D1/D2/D3/S1 (Diploma/Bachelor's)	13	30.20%
Total		43	100%
Length of Business	< 5 years	20	46.50%
	5–10 years	16	37.20%
	>10 years	7	16.30%
Total		43	100%

Source: primary data processed, 2025.

As outlined in the Table 2, the respondents in this study consisted of 22 men, or 51.2%, and 21 women, or 48.8%. Thus, the number of male respondents was slightly higher than female respondents. By age, 13 respondents, or 30.3%, were 18–30 years old, 18 respondents, or 41.8%, were 31–50 years old, and 12 respondents, or 27.9%, were over 50 years old. The 31–50 age group had the largest number of respondents, at 41.8%.

By final level of education, 4 respondents, or 9.4%, had an elementary/junior high school education, 26 respondents, or 60.4%, had a senior high school education, and 13 respondents, or 30.2%, held a D1/D2/D3/S1 (diploma/bachelor's) qualification. The most common level of education among respondents was senior high school, at 60.4%. Meanwhile, respondents' length of business operation was as follows: less than 5 years for 20 respondents, or 46.5%; 5–10 years for 16 respondents, or 37.2%; and more than 10 years for 7 respondents, or 16.3%. Thus, the majority of respondents had a business that had been operating for less than 5 years, at 46.5%.

Data Validity Testing

Validity Test

To establish the soundness of the research instrument, a validity test was conducted. When the r-statistic exceeds the r-table, an item is judged valid, and when the r-statistic

falls below it, the item is judged invalid. The validity testing relied on the formula df = N-2. With df = 43 – 2 = 41, the resulting r-table value is 0.1796 at α = 0.05. The validity testing outcomes for the study variables are reported below.

Table 3. Validity Test Results

Variable	Item No.	r-statistic	r-table	Description
Eco-Adopter (X1)	X1.1	0.618	0.1796	Valid
	X1.2	0.711	0.1796	Valid
	X1.3	0.799	0.1796	Valid
	X1.4	0.775	0.1796	Valid
Eco-Entrepreneur (X2)	X2.1	0.810	0.1796	Valid
	X2.2	0.651	0.1796	Valid
	X2.3	0.878	0.1796	Valid
	X2.4	0.865	0.1796	Valid
Eco-Innovator (X3)	X3.1	0.807	0.1796	Valid
	X3.2	0.820	0.1796	Valid
	X3.3	0.841	0.1796	Valid
	X3.4	0.853	0.1796	Valid
MSME Sustainability (Y)	Y1	0.647	0.1796	Valid
	Y2	0.778	0.1796	Valid
	Y3	0.821	0.1796	Valid
	Y4	0.814	0.1796	Valid

Source: primary data processed, 2025.

Looking at the Table 3, the validity test results for each statement item, the Eco-Adopter (X1), Eco-Entrepreneur (X2), Eco-Innovator (X3), and MSME Sustainability (Y) variables show r-statistic values greater than r-table for every item. Therefore, all questionnaire statements can be concluded to be valid and may be included in subsequent analysis.

Reliability Test

To gauge reliability, this research relied on the Cronbach's alpha formula. Reliability testing produced the findings for the research variables that are laid out below:

Table 4. Reliability Test Results

Variable	Calculated Cronbach's Alpha	Standard Cronbach's Alpha	Description
Eco-Adopter (X1)	0.868	0.60	Reliable
Eco-Entrepreneur (X2)	0.813	0.60	Reliable
Eco-Innovator (X3)	0.856	0.60	Reliable
MSME Sustainability (Y)	0.753	0.60	Reliable

Source: primary data processed, 2025.

Table 4 presents that all four variables, namely Eco-Adopter, Eco-Entrepreneur, Eco-Innovator, and MSME Sustainability, record a Cronbach's alpha above 0.60. Accordingly, all statement items can be judged reliable and hypothesis testing may proceed.

Hypothesis Testing

Spearman Rank Correlation

Information regarding the interplay among the study's IV is supplied by the Spearman rank correlation, which relies on this decision-making rule: should the significance value (2-tailed) be greater than 0.05, H0 is accepted; should it be less than 0.05, H0 is rejected.

Table 5. Spearman Rank Correlation Test Results

			Eco-Adopter	Eco-Entrepreneur	Eco-Innovator	MSME Sustainability
Spearman's rho	Eco-Adopter	Correlation Coefficient	1.000	.513**	.539**	.643**
		Sig. (2-tailed)	-	.000	.000	.000
		N	43	43	43	43
	Eco-Entrepreneur	Correlation Coefficient	.513**	1.000	.465**	.729**
		Sig. (2-tailed)	.000	-	.000	.000
		N	43	43	43	43
	Eco-Innovator	Correlation Coefficient	.539**	.465**	1.000	.486**
		Sig. (2-tailed)	.000	.000	-	.000
		N	43	43	43	43
	MSME Sustainability	Correlation Coefficient	.643**	.729**	.486**	1.000
		Sig. (2-tailed)	.000	.000	.000	-
		N	43	43	43	43

**Correlation is significant at the 0.01 level (2-tailed).

Source: primary data processed, 2025.

Drawing on the data in Table 5, the following points emerge:

Hypothesis 1

The Eco-Adopter variable records a 2-tailed significance value of 0.000, a figure smaller than 0.05. These results lead to the rejection of H0 and the acceptance of H1, meaning a meaningful link exists between Eco-Adopter and MSME sustainability. The strength of the relationship between Eco-Adopter and MSME sustainability is 0.643, indicating a strong relationship. This figure is positive, indicating a unidirectional relationship, meaning that the adoption of Eco-Adopter practices can increase MSME sustainability.

Hypothesis 2

The Eco-Entrepreneur variable records a 2-tailed significance value of 0.000, a figure smaller than 0.05. Accordingly, H2 is accepted and H0 is rejected, meaning a meaningful link exists between Eco-Entrepreneur and MSME sustainability. The strength of the relationship between Eco-Entrepreneur and MSME sustainability is 0.729,

indicating a strong relationship. This figure is positive, indicating a unidirectional relationship, meaning that a higher level of Eco-Entrepreneur can increase MSME sustainability.

Hypothesis 3

The Eco-Innovator variable records a 2-tailed significance value of 0.000, a figure smaller than 0.05. Accordingly, H3 is accepted and H0 is rejected, meaning a meaningful link exists between Eco-Innovator and MSME sustainability. The strength of the relationship between Eco-Innovator and MSME sustainability is 0.486, indicating a moderate relationship. This figure is positive, indicating a unidirectional relationship, meaning that a higher level of Eco-Innovator can increase MSME sustainability.

Kendall's W

The Kendall's W test was performed to examine the association between the DV and IVs, applying the following decision rule: H0 is retained when the significance value exceeds 0.05 and rejected when it falls below 0.05. The test results are reported below:

Table 6. Kendall's W Test Results

Test Statistics	
N	43
Kendall's W[a]	.777
Chi-Square	198.026
Df	3
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Source: primary data processed, 2025.

The Kendall's W test in Table 6 yielded a significance value of 0.000, which is less than 0.05. This suggests that Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator show a significant level of agreement (concordance) in the assessment of MSME sustainability. H0 is thus rejected, leading to the conclusion that the three aspects exhibit significant agreement in the context of MSME sustainability assessment.

Ordinal Regression Test

This study tests the hypotheses using ordinal regression analysis. Ordinal regression was chosen because the MSME Sustainability variable (Y) is measured on an ordinal scale and classified into three ordered categories, namely low, medium, and high. These categories have a clear order, but the distance between categories cannot be assumed to be equal. Therefore, ordinal regression is considered appropriate for analyzing the relationship between the Eco-Adopter (X1), Eco-Entrepreneur (X2), and Eco-Innovator (X3) variables and the ordered categories of MSME Sustainability (Y). The table 7 below detail the findings of the ordinal regression analysis.

Table 7. Case Processing Overview

		N	Marginal Percentage
MSME Sustainability	Low	10	23.3%
	Medium	20	46.5%
	High	13	30.2%
Eco-Adopter	Low	9	20.9%
	Medium	13	30.2%
	High	21	48.8%
Eco-Entrepreneur	Medium	22	51.2%
	High	21	48.8%
Eco-Innovator	Low	8	18.6%
	Medium	12	27.9%
	High	23	53.5%
Valid		43	100.0%
Missing		0	
Total		43	

Source: primary data processed, 2025.

Table 7 presents the quantity of data examined was 43 and all data could be processed because there was no data classified as missing. Based on data from the 43 respondents, it is known that 10 respondents, or 23.3%, fell into the low MSME sustainability category, 20 respondents, or 46.5%, fell into the medium category, and 13 respondents, or 30.2%, fell into the high category. For the Eco-Adopter variable, 13 respondents, or 30.2%, fell into the medium category and 21 respondents, or 48.8%, fell into the high category, while 9 respondents, or 20.9%, fell into the low category. For Eco-Entrepreneur, 22 respondents, or 51.2%, fell into the medium category and 21 respondents, or 48.8%, fell into the high category. For the Eco-Innovator variable, 8 respondents, or 18.6%, fell into the low category, 12 respondents, or 27.9%, fell into the medium category, and 23 respondents, or 53.5%, fell into the high category.

Table 8. Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	87.964			
Final	41.939	46.024	5	.000

Link function: Logit. Source: primary data processed, 2025.

Table 8 above evaluates the overall significance of the ordinal regression model. For the intercept-only model, which excludes the independent variable (IV), the -2 Log Likelihood is 87.964. Meanwhile, the -2 Log Likelihood value after including the IV in the model (final) is 41.939. There is a change in the Chi-Square value of 46.024, and the significance column in the model fitting information is 0.000, indicating that the model is significant.

Table 9. Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	21.332	17	.212
Deviance	18.668	17	.348

Link function: Logit. Source: primary data processed, 2025.

Looking at the Table 9, details are gathered about the degree to which the model suits the data. According to the rule for decision-making, the model counts as significant when the significance value surpasses alpha (0.05), and it counts as not significant when that value falls under alpha (0.05). The Goodness-of-Fit table shown above reveals the fit to the data. With a Pearson value of 21.332 and sig. 0.212, which is above 0.05, along with a deviance value of 18.668 and sig. 0.348, which likewise exceeds 0.05, the conclusion is that the model fits, meaning it is significant.

Table 10. Pseudo R-Square

Cox and Snell	.418
Nagelkerke	.481
McFadden	.265

Link function: Logit. Source: primary data processed, 2025.

The Pseudo R-Square results in Table 10 show a Nagelkerke Pseudo R-Square value of 0.481. This value signifies the relative explanatory power of the ordinal regression model regarding variation in MSME Sustainability categories. Unlike R^2 in linear regression, the Nagelkerke Pseudo R-Square is not interpreted directly as a percentage of variance explained, since it is a Pseudo R-Square measure used in ordinal regression.

Table 11. Parameter Estimates

		Estimate	**Std. Error**	**Wald**	**df**	**Sig.**
Threshold	[rY = 1.00]	-3.917	.630	38.698	1	.000
	[rY = 2.00]	-.482	.378	1.629	1	.002
Location	[rX1=2.00]	-2.331	.576	16.369	1	.000
	[rX1=3.00]	0[a]	.	.	0	.
	[rX2=1.00]	-5.187	1.245	17.353	1	.000
	[rX2=2.00]	.003	.725	.000	1	.007
	[rX2=3.00]	0[a]	.	.	0	.
	[rX3=1.00]	-2.755	1.292	4.550	1	.003
	[rX3=2.00]	-.508	.527	.928	1	.035
	[rX3=3.00]	0[a]	.	.	0	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.
Source: primary data processed, 2025.

According to the parameter estimation results in Table 11, Eco-Adopter has a significant effect on MSME sustainability, with a significance value of 0.000. Eco-Entrepreneur also proves significant, reflected in significance values of 0.000 and 0.007 across the respective test categories. Likewise, Eco-Innovator has a significant effect on MSME sustainability, with significance values of 0.003 and 0.035. All of these significance values are below the 0.05 significance threshold. These results reveal that the three variables, namely Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator, have a

significant effect on MSME sustainability.

Discussion

The Effect of Eco-Adopter (X1) on MSME Sustainability (Y)

Evidence from this research demonstrates that Eco-Adopter contributes positively to MSME sustainability. The Spearman rank test for the Eco-Adopter variable produced a sig. (2-tailed) value of 0.000, which is under 0.05, thereby leading to H1 being accepted and H0 being turned down. A regression coefficient of 0.643, positive in direction, reflects a powerful linkage, suggesting that MSME sustainability can be enhanced when Eco-Adopter practices are put into use. Furthermore, a significance value of $0.007 < 0.05$ was found for the Eco-Adopter (X1) variable in the ordinal regression results under parameter estimates, signifying that Eco-Adopter (X1) significantly influences MSME Sustainability (Y) among MSMEs in the Tofu Production Sector in Kediri City.

In line with the Eco-Adopter theory put forward by Siregar and Pinagara (2022), the initial steps taken by an Eco-Adopter (such as resource efficiency and waste reduction) result in reduced operational costs and an improved image/reputation, which ultimately strengthens the long-term competitiveness and sustainability of the MSME. In addition, according to Purwandani and Michaud (2021), the majority of MSMEs are still at the non-adoption stage or the early Eco-Adopter stage, meaning that their adoption of green practices is still partial and not yet comprehensive. Research shows that more than 80% of MSMEs in Indonesia have not comprehensively adopted green business practices.

Such a finding corresponds with prior work by Reniati and Faisal (2023), whose conclusion was that Eco-Entrepreneur and Eco-Adopter impact the business continuity of MSME actors. It also matches the research of Yusfiarto (2023), which concluded that Eco-Entrepreneur and Eco-Adopter impact the Business Continuity of MSMEs. Alraja et al. (2022) lend further support to this finding, showing that sustainable green practices can bolster the sustainable performance of MSMEs. This suggests that environmentally friendly practices serve not only as a demonstration of environmental concern but also as a means of supporting continued business performance. Furthermore, Indrawati et al. (2025) showed that organizational, technological, and environmental factors play a role in encouraging the adoption of green innovation in MSMEs in Indonesia. This finding indicates that the success of Eco-Adopter is influenced by the internal readiness of MSMEs and a supportive business environment. In line with this, Lestari and Sunyoto (2023) found that green innovation contributes positively to the sustainable performance of MSMEs in Indonesia. Thus, the results of this study reinforce that Eco-Adopter is an important initial stage for MSMEs to begin implementing environmentally friendly practices, which can then support the improvement of business sustainability. According to the authors' own study, Eco-Adopter impacts MSME sustainability. Consequently, Eco-Adopter can be said to have a positive and significant influence on MSME sustainability among MSMEs within the Tofu Industry Sector in Kediri City.

The Effect of Eco-Entrepreneur (X2) on MSME Sustainability (Y)

Evidence from this research demonstrates that Eco-Entrepreneur contributes positively to MSME sustainability. The Spearman rank test for the Eco-Entrepreneur variable produced a sig. (2-tailed) value of 0.000, which is under 0.05, thereby leading to H2 being accepted and H0 being turned down. A regression coefficient of 0.729, positive in direction, reflects a powerful linkage, suggesting that MSME sustainability can be enhanced when Eco-Entrepreneur levels rise. Furthermore, in the ordinal regression results under parameter estimates, the significance value of the Eco-Entrepreneur (X2) variable is 0.000 < 0.05, meaning that the Eco-Entrepreneur (X2) variable has a significant effect on MSME Sustainability (Y) among MSMEs in the Tofu Industry Sector in Kediri City.

Eco-Entrepreneur, according to the OJK (Indonesian Financial Services Authority) as cited in Adi et al. (2021), refers to knowledge, skills, and beliefs that influence attitudes and behavior toward improving decision-making and leadership quality and attaining well-being. A good understanding of Eco-Entrepreneur is considered important for MSMEs. A good understanding enables an entrepreneur to grasp financial management practices that influence the company's future progress. Therefore, Eco-Entrepreneur is needed so that MSMEs can remain sustainable. Field findings show that on average, respondents agreed that Eco-Entrepreneur can improve business continuity. In this regard, the better the Eco-Entrepreneur quality possessed by MSME actors in the Tofu Industry Sector in Kediri City, the more it can improve business continuity.

Prior work by Idawati and Pratama (2020) corresponds with this finding, as their results indicated a meaningful influence of Eco-Entrepreneur on the performance and continuity of MSMEs in Denpasar City. In the same vein, research from Rumini and Martadiani (2020) established that Eco-Entrepreneur leaves a positive and significant mark on SME performance and SME sustainability. The authors' own study found that Eco-Entrepreneur impacts MSME sustainability positively and significantly. As a result, Eco-Entrepreneur can be said to have a positive and significant influence on MSME sustainability among MSMEs within the Tofu Industry Sector in Kediri City. This similarity of findings shows that Eco-Entrepreneur reflects business actors' concern for environmental aspects and also a business management orientation that considers sustainability in the decision-making process. This orientation allows environmental aspects to be positioned as part of the business's strategic considerations, so that decisions related to resource use, operational efficiency, and business continuity are not based solely on short-term interests. Green entrepreneurial orientation was found by Narto et al. (2025) to have a significant effect on MSME sustainability performance. Through the implementation of green product innovation and green process innovation (Coelho et al., 2023), green entrepreneurial orientation also plays a role in encouraging sustainability performance and supports the improvement of sustainable performance in MSMEs (Angeline & Andrian, 2025). Meanwhile, a positive and significant relationship between green entrepreneurial orientation and sustainability performance in MSMEs was shown by Hermawan et al. (2025). These findings reinforce the argument that an entrepreneurial

orientation that integrates the environmental dimension can create conditions that are more supportive of business sustainability, because MSME actors are not only oriented toward achieving current performance, but also consider the consequences of business management for the continuity of business activities. In the context of the tofu industry, the relevance of this relationship becomes more apparent as business sustainability cannot be separated from how business actors manage resources and respond to the environmental issues that accompany production activities.

The Effect of Eco-Innovator (X3) on MSME Sustainability (Y)

Evidence from this research demonstrates that Eco-Innovator contributes positively to MSME sustainability. The Spearman rank test for the Eco-Innovator variable produced a sig. (2-tailed) value of 0.000, which is under 0.05, thereby leading to H3 being accepted and H0 being turned down. A regression coefficient of 0.486, positive in direction, reflects a moderate linkage, suggesting that MSME sustainability rises alongside higher Eco-Innovator levels. Furthermore, under parameter estimates in the ordinal regression results, the Eco-Innovator (X3) variable shows significance values that are all below 0.05, indicating that Eco-Innovator (X3) significantly affects MSME Sustainability (Y) among MSMEs in the Tofu Industry Sector in Kediri City.

In line with Eco-Innovator theory, Eco-Innovator is the highest stage in the Green MSME classification model, describing a business entity that not only adopts environmentally friendly practices but also actively creates, develops, and introduces new innovations to address environmental problems (Fauziah et al., 2025). Eco-Innovator, or Eco-Innovation, is a key factor (generally treated as an IV) used to explain the positive impact generated by a company's environmental commitment on business aspects such as performance, competitiveness, and sustainability.

Such a finding corresponds with prior work by Yanti et al. (2022), whose results indicated that Eco-Innovator and Eco-Entrepreneur jointly leave a positive and significant mark on the business continuity of culinary businesses in West Palu District. Likewise, research by Astuti et al. (2018) established that Eco-Innovator impacts business sustainability and financial performance of MSMEs, and that Eco-Entrepreneur impacts financial performance among MSMEs in the Greater Solo area. According to the authors' own study, Eco-Innovator impacts MSME sustainability. Hence, Eco-Innovator has a positive and significant influence on MSME sustainability among MSMEs in the Tofu Industry Sector in Kediri City.

The Effect of Eco-Adopter (X1), Eco-Entrepreneur (X2), and Eco-Innovator (X3) on MSME Sustainability (Y)

According to the research outcomes, Eco-Entrepreneur, Eco-Adopter, and Eco-Innovator each contribute positively and significantly to MSME sustainability. The Kendall's W test supports this, producing a significance value of 0.000, which satisfies $0.000 < 0.05$, thereby leading to H4 being accepted and H0 being turned down. Moreover, the Pseudo R-Square from the ordinal regression output shows a Nagelkerke value of

0.481. This result shows that the ability of the Eco-Entrepreneur, Eco-Adopter, and Eco-Innovator variables to explain the MSME Sustainability (Y) variable is 0.481, or 48.1%, while other variables account for the rest. Findings here correspond with research carried out by Yuningsih & Yulianingsih (2022) and Yanti et al. (2022). Although conducted independently, both studies similarly revealed that Eco-Entrepreneur, Eco-Adopter, and Eco-Innovator leave a positive and significant impact on MSME sustainability.

This research contributes new insight by testing Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator together in explaining MSME sustainability within Kediri City's tofu processing sector, using four Green MSME aspects, namely production, marketing, human resources, and finance. This approach shows that the sustainability of tofu processing MSMEs is not only related to the implementation of environmentally friendly practices in the production process (Ardhiyansyah & Juniansyah, 2024), but also includes how these practices are applied in marketing (Nafisah & Shiratina, 2026), human resource management (Sulaeman & Kurniawati, 2023), and the finance aspect (Nohong et al., 2024; Sumastuti et al., 2024). Accordingly, the findings expand the understanding of Green MSME transformation in the tofu processing sector by demonstrating that progress in the Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator stages is positively and significantly linked to business sustainability. These findings also provide a wider picture of the implementation of Green MSMEs in tofu processing sector MSMEs compared to previous studies, which tended to focus on specific aspects or stages.

Practical implications for stakeholders in supporting the transformation of Green MSMEs in the tofu processing sector also emerge from this study's findings. MSME actors can use the results as a reference for pinpointing the production stages with the greatest potential for improvement, for example, stepwise soybean washing, process water recycling, the use of energy-efficient stoves, and turning tofu dregs and whey into value-added products. These measures have been shown to improve production efficiency while reducing operational costs (Aulia & Indrasti, 2023; Yulistika et al., 2023). For the government, the findings underline the importance of policy support in the form of clear regulations, incentives or subsidies, and technical assistance, because government support has been shown to be an external factor that makes it easier for MSMEs to adopt green production practices (Primandaru et al., 2023). In addition, the low environmental awareness among small-scale tofu industry actors (Aulia & Indrasti, 2023) indicates the need for literacy and capacity-building programs, which can be strengthened through collaboration among local governments, universities, financial institutions, and tofu artisan communities. Hence, the findings of this study are expected to inform the design of more integrated strategies and programs that support a sustainable Green MSME transformation.

CONCLUSION

Based on the analysis of MSME business transformation through the Green MSME concept, which encompasses Eco-Adopter, Eco-Entrepreneur, and Eco-Innovator, it can be concluded that the implementation of green business practices contributes positively

to MSME sustainability, in the environmental dimension through resource efficiency and waste reduction, in the economic dimension through lower costs and higher income, and in the social dimension through improved image and competitiveness. However, most MSMEs are still at the Pre-Eco-Adopter and Eco-Adopter stages, so the transition toward Eco-Entrepreneur and Eco-Innovator still faces an implementation gap. To address this, ecosystem support is needed, including government policies and incentives tailored to the MSME development stage (such as certification and training subsidies for Eco-Adopters, and commercial financing facilitation and Intellectual Property Rights protection for Eco-Innovators), strengthened green infrastructure that can be used collectively, the development of green microfinance schemes by financial institutions and fintech accompanied by improved green financial literacy, and enhanced MSME capacity in applying green SOPs, waste management, and digital technology through collaboration in green clusters. The study's outcomes may also be used by MSMEs as a point of reference in other sectors and regions by adapting the form of policies, incentives, training, and ecosystem support to the characteristics of each sector and local conditions.

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