jotaf Journal of Tekirdag Agricultural Faculty
Tekirdağ Ziraat Fakültesi Dergisi

Ekim/October 2025, 22(4)
Başvuru/Received: 18/05/25
Kabul/Accepted: 20/08/25
DOI: 10.33462/jotaf.1701495

http://dergipark.gov.tr/jotaf
http://jotaf.nku.edu.tr/

ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Indonesia Coffee Export Performance to the Primary Destination Countries

Posma Mangasi Pintaria MARBUN[1*], Fransisca Natalia SIHOMBING[2], Ratna Rosanty LAHAY[3], Koko TAMPUBOLON[4]

Abstract

Coffee is a key plantation-sector commodity in Indonesia, playing a critical role in the national economy. This study examines the determinants of Indonesia's coffee export performance across eight major destination countries: the United States, Germany, Malaysia, Italy, Russia, Japan, the United Kingdom, and Belgium. Utilizing 33 years of secondary time-series data (1992–2024), panel data regression was analyzed using the Chow, Hausman, and Lagrange multiplier tests to determine the most suitable model. Subsequently, classical assumption tests (multicollinearity, heteroscedasticity, and autocorrelation) were conducted, followed by statistical tests (F-test, t-test, and determination coefficient). The results indicated that the Random Effects Model (REM) was the most suitable in this study. The REM regression reveals that a one-unit increase (of 1,000 US$ and US$/lb) in Free on Board (FOB) and Indonesia's Coffee Prices (ICP) raises Indonesia's coffee export volume by 0.2117 and 1312.4875 tons. The coefficient of determination showed that 12.56% of the variation in Indonesia's coffee export performance to eight destination countries is explained by the Rupiah Exchange Rate (RER), Free on Board (FOB), Gross Domestic Product per capita (GDPc), Indonesia's Coffee Prices (ICP), and Indonesia Coffee Yield (ICY). The t-test indicated that FOB and ICP as the key drivers of coffee exports performance. To enhance coffee export volumes, the government and relevant stakeholders should strengthen the global branding of Indonesian coffee, address trade barriers, and leverage existing trade agreements to enhance long-term FOB values. The Indonesian government can boost domestic coffee prices (ICP) through initiatives like cooperatives, financial aid, and specialty coffee promotion. Policy reforms are crucial to tackle low financial literacy and market volatility. Enhancing infrastructure, market access, and support can stabilize prices and improve farmers' livelihoods.

Keywords: Coffee export, Export markets, Panel data, Performance, Quantity

[1]***Sorumlu Yazar/Corresponding Author:** Posma Mangasi Pintaria Marbun, Program Study of Agrotechnology, Faculty of Agriculture, Universitas Sumatera Utara, Medan, Indonesia. E-mail: posmamarbun12@gmail.com OrcID: 0000-0002-3180-1009
[2]Fransisca Natalia Sihombing, Graduate of Agribusiness Magister, Faculty of Agriculture, Universitas Sumatera Utara, Medan, Indonesia. E-mail: sihombingfransisca93@gmail.com OrcID: 0000-0002-2853-603X.
[3]Ratna Rosanty Lahay, Program Study of Agrotechnology, Faculty of Agriculture, Universitas Sumatera Utara, Medan, Indonesia. E-mail: ratna.rlahay@usu.ac.id OrcID: 0009-0002-9955-8866.
[4]Koko Tampubolon, Research Center for Food Crops, Research Organization for Agriculture and Food, National Research and Innovation Agency, West Java, Bogor, Indonesia. E-mail: koko.tampubolon@brin.go.id OrcID: 0000-0002-7969-5049.
Atf/Citation: Marbun, P. M. P., Sihombing, F. N., Lahay, R. R., Tampubolon, K. (2025). Indonesia coffee export performance to the primary destination countries. *Journal of Tekirdag Agricultural Faculty,* 22(4): 1072-1085.

1. Introduction

Indonesia adheres to an open economic system relying on international trade to drive economic growth. As an agrarian country, its economy is fundamentally supported by agricultural commodities which are traded both domestically and internationally through export activities, especially plantation crops such as coffee. The growing global demand for coffee offers Indonesia a strategic opportunity to enhance its coffee export market share (Suryana et al., 2024; Gürbüzer and Çiftci, 2025). These exports play a critical role in enhancing state revenue, generating foreign exchange, expanding employment opportunities, and raising farmer incomes. Empirical evidence shows that quality influences export performance, with higher-quality products leading to better export outcomes (Macedo et al., 2019). According to USDA (2025), Indonesia ranks as the fourth-largest coffee exporter globally contributing 6% of total exports, following Brazil (38%), Vietnam (17%), and Colombia (7%). Data from the Ministry of Agriculture (2023) further indicate that Indonesia's coffee exports over a 33-year period (1992–2024) experienced fluctuations, averaging 371,787 tons annually (Figure 1). The fluctuations in coffee exports were driven by multiple factors, including coffee prices, prices of substitute goods, total production volume, consumer preferences, income levels, gross domestic product per capita, exchange rate variability, and government policies. Wishanesta and Setiawina (2019) identified several factors contributing to the fluctuating volume of Indonesia's coffee exports such as low international coffee prices, increasingly competitive global trade, political-economic policy constraints, and sluggish market demand reducing exporter incentives. Additionally, the rapid growth of coffee shops across major Indonesian cities has diverted a portion of coffee production toward domestic consumption reducing the volume available for export.

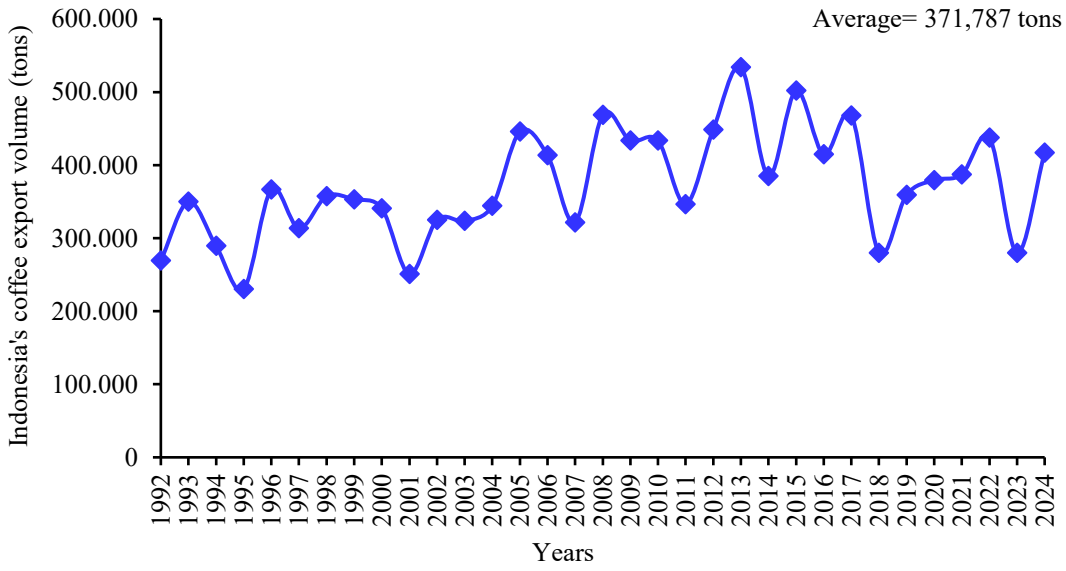

Figure 1. The total volume of Indonesia's coffee exports over a 33-year period (1992–2024). Source: Ministry of Agriculture (2023)

Several previous studies have identified Gross Domestic Product per capita (GDPc), Indonesia Coffee Prices (ICP), Indonesia Coffee Yield (ICY), Rupiah Exchange Rate (RER), Free on Board (FOB), and other factors as significant determinants of Indonesia's coffee export performance. Arfah and Putra (2020) found that production levels, exchange rates, and coffee prices significantly influenced the growth of Indonesia's coffee exports over a 18-year period. Farlian and Masthura (2021) demonstrated that international coffee prices and the rupiah exchange rate to dollar had a statistically significant positive effect on the export performance of Gayo coffee to the United States. Hasanah and Prasetyanto (2022) confirmed that international coffee prices played a crucial role in enhancing Indonesia's coffee export performance, both in the short and long term. Sihombing et al. (2020) further supported these findings, showing that FOB, ICP, RER, GDPc, and ICY collectively contributed to a significant improvement in coffee export volumes to key markets such as the United States, Malaysia, and Japan. Indonesian coffee exports have been extensively studied in the context of specific destination countries over short-term periods. However, there are limited studies that simultaneously examined its performance across the eight largest coffee-consuming destination countries. The urgency of studying the factors affecting coffee export performance is

highlighted by the significant economic, competitive, and sustainability implications. Comprehensive research in this area can provide valuable insights and strategic recommendations to enhance the performance and competitiveness of coffee exports globally. This study aimed to analyze the factors influencing the export performance of Indonesian coffee to these eight major markets. The findings of this study are expected to provide more targeted policy recommendations to enhance the competitiveness of Indonesian coffee exports in the global market.

2. Materials and Methods

2.1. Study area and data source

This study examines Indonesia's coffee exports to eight major destination countries, such as the United States, Malaysia, Japan, Italy, Germany, the United Kingdom, Belgium, and Russia, covering a 33-year period (1992–2024), as per BPS-Statistics Indonesia (2025). The year-on-year (YoY) changes in export volumes to these countries reveal significant fluctuations across the observed period (*Table 1*). On average, Indonesian coffee exports experienced YoY growth in most destinations: the United States (5.85%), Germany (23.67%), Malaysia (16.83%), Italy (3.42%), Russia (23.59%), and the United Kingdom (9.14%). In contrast, exports to Japan declined by an average of 2.79%, while Belgium recorded the highest growth at 38.89%. Data on FOB and ICY were sourced from BPS-Statistics Indonesia, whereas the ICP were obtained from the International Coffee Organization. Additionally, RER data (USD/IDR, EUR/IDR, JPY/IDR, MYR/IDR, RUB/IDR, GBP/IDR) was collected from Investing.com and GDPc was collected from Trading Economics. The study was conducted from August to October 2022 with supplementary data analysis extending into 2025, utilizing exclusively secondary data sources.

2.2. Panel data regression

The data analysis method employs panel data regression analysis using EViews 13 software, incorporating several estimation approaches (Chow, Hausman, and Lagrange) to determine the most appropriate model. In the Chow test approach, if the probability value exceeds 0.05, the Common Effect Model (CEM) is selected; otherwise, the Fixed Effect Model (FEM) is used. For the Hausman test, a probability value greater than 0.05 indicates that the Random Effect Model (REM) is appropriate, while a value below this threshold favors the FEM. Additionally, in the Lagrange approach, a probability value above 0.05 leads to the selection of the CEM, whereas a lower value supports the use of the REM (Gujarati and Porter, 2009). The CEM assumes that all cross-sectional units share the same intercept, disregarding individual-specific effects. This approach is useful when individual-specific effects can be neglected or when the focus is on overall trends rather than individual differences (Muhith et al., 2022). In contrast, the FEM controls for unobserved heterogeneity by allowing each cross-sectional unit to have its own intercept, which captures time-invariant characteristics (Danilevicz et al., 2024). The advantages of FEM include: controlling for unobserved heterogeneity across units thereby reducing omitted variable bias; and suitability for cases where individual-specific effects are correlated with explanatory variables. Conversely, the REM assumes that individual-specific effects are random and uncorrelated with the explanatory variables, thereby allowing the inclusion of time-invariant variables. This model can estimate the effects of time-invariant covariates and is particularly suitable when individual effects exhibit no correlation with the explanatory variables (Honoré and Kesina, 2017). The panel data regression model for factors influencing the performance of Indonesia's coffee exports to primary destination countries was formulated as follows:

$$PICE = b0 + b1\,FOB + b2\,ICP + b3\,RER + b4\,GDPc + b5\,ICY + \varepsilon \quad \text{(Eq. 1)}$$

Note:
PICE= Performance of Indonesia coffee exports (000.000 tons)
FOB= Free on board value of Indonesia (000.000 US$)
ICP= Indonesia coffee prices (US$/lb)
RER= Rupiah exchange rate (USD/IDR, EUR/IDR, JPY/IDR, MYR/IDR, RUB/IDR, GBP/IDR)
GDPc= Gross domestic product per capita (US$ milyar)
ICY= Indonesia coffee yield (thousands ton)
b_0= Intercept
$b_{1,2,3,4,5}$= Variables coefficient
ε= Error term

Table 1. Year-on-year (YoY) changes in Indonesia's coffee exports over a 33-year period (1992–2024)

Years	YoY of Indonesia's coffee exports to eight major destination countries (%)							
	United States	**Germany**	**Malaysia**	**Italy**	**Russia**	**Japan**	**United Kingdom**	**Belgium**
1992	-	-	-	-	-	-	-	-
1993	14.29	19.23	100.00	20.01	110.63	-7.02	109.10	189.93
1994	-20.83	512.90	50.00	-33.34	47.48	7.55	-8.70	141.36
1995	31.58	-91.58	33.33	12.51	28.77	-22.81	-23.81	-28.57
1996	139.99	81.25	25.00	44.43	22.34	40.91	25.00	32.00
1997	1.42	-13.79	20.00	7.69	22.61	-12.90	-55.00	-30.30
1998	6.82	12.00	16.67	0.01	18.44	3.70	-11.12	26.09
1999	-44.61	-10.71	14.29	35.71	12.58	19.64	50.00	-49.99
2000	-7.87	-4.72	98.02	2.32	13.83	-2.50	-7.59	86.52
2001	10.59	-38.27	19.35	-41.57	9.81	-10.67	-46.66	14.85
2002	17.32	82.05	10.05	32.14	11.06	-2.99	77.17	34.90
2003	11.76	7.56	-40.42	65.92	8.05	-7.53	16.53	-49.69
2004	50.68	-6.57	12.74	-14.29	9.22	3.80	-14.23	113.42
2005	16.09	46.36	0.16	42.87	6.82	-8.86	56.97	43.60
2006	1.64	-23.53	29.60	-9.39	7.14	35.31	-25.52	15.23
2007	-22.55	-28.48	45.96	-29.33	7.38	-22.81	-27.95	-1.03
2008	-0.87	108.02	40.00	54.71	5.55	2.45	71.44	151.71
2009	9.08	-11.97	2.49	19.78	5.26	1.30	8.60	-9.60
2010	-11.95	-19.26	47.17	-26.02	6.18	10.23	48.20	-50.33
2011	-23.72	-58.45	0.69	2.14	-44.24	-0.49	-38.92	15.03
2012	44.90	92.65	25.66	6.35	94.10	-12.64	9.71	-19.49
2013	-5.09	18.52	22.46	31.19	33.85	-18.50	27.39	35.01
2014	-11.84	-37.14	-28.23	-22.04	8.90	-1.64	-30.95	-31.16
2015	12.30	25.50	31.71	44.72	-14.16	0.01	46.72	-61.36
2016	2.79	-10.56	1.78	-16.79	0.00	-14.28	-12.81	119.29
2017	-6.05	4.95	5.97	6.37	52.49	-16.54	19.51	8.26
2018	-17.64	-70.76	-9.84	-26.70	-79.98	2.92	-65.56	-52.82
2019	12.64	41.04	-7.12	26.93	50.28	-15.73	150.47	161.96
2020	-7.15	15.56	4.39	-23.17	117.73	-8.27	12.82	-9.23
2021	5.91	-37.46	-19.36	-9.72	-64.41	16.30	-42.58	-2.20
2022	-3.27	177.29	-10.50	-2.37	163.73	-31.08	69.48	53.66
2023	-34.37	-74.42	-13.12	-24.51	-67.37	-18.59	-79.12	-84.53
2024	20.97	73.80	26.43	-63.86	186.23	-0.38	-7.14	520.78
Average	**5.85**	**23.67**	**16.83**	**3.42**	**23.95**	**-2.79**	**9.14**	**38.89**

Source: Processed data from BPS-Statistics Indonesia (2025)

2.3. Classical assumption test

Statistical analysis of the data can proceed if the multicollinearity, heteroscedasticity, and autocorrelation tests meet the required assumptions (Ariefianto, 2012). The multicollinearity was assessed using the Variance Inflation Factor (VIF). A VIF value below 10 indicates the absence of multicollinearity in the regression model (O'brien, 2007). For the heteroscedasticity test, the probability value was compared against a 5% significance level; a probability value less than 0.05 indicated heteroscedasticity, while a value above 0.05 suggested its absence. The autocorrelation test was conducted by evaluating the Durbin-Watson (DW) statistic against critical values. A DW value between 1.65 and 2.35 confirmed the absence of autocorrelation, whereas values in the ranges of 1.21–1.65 or 2.35–2.79 were considered inconclusive. Autocorrelation was deemed present if the DW value fell below 1.21 or exceeded 2.79 (Trihendardi, 2007).

2.4. Statistical test

The F-test and t-test were performed by comparing the probability value (p-value) with a significance level of 5% and 1%. If the p-value was less than 0.05 and 0.01, the effect was considered statistically significant and highly significant. Otherwise, it was deemed insignificant, both concurrently and partially. The coefficient of determination (R^2) indicates the strength of the relationship between the independent and dependent variables with R^2 values ranging from 0 to 1 (Gujarati, 2007).

3. Results and Discussion

3.1. Year-on-year (YoY) changes in the FOB, ICP, RER, GDPc

Year-on-year (YoY) changes in FOB value to eight destination countries (the United States, Germany, Malaysia, Italy, Russia, Japan, the United Kingdom, and Belgium) over a 33-year period (1992–2024) fluctuated with average of 12.97; 14.32; 23.78; 8.91; 33.29; 4.92; 16.90; and 44.16% respectively (*Table 2*). The FOB values reflects rising global demand for Indonesian coffee driven by its unique quality and competitive pricing, improvements in trade agreements, and export infrastructure. Similarly, the YoY changes in ICP value for the eight export destinations over the similar period also exhibited fluctuations with average rates of 1.83; 11.45; 0.75; 10.57; 1.32; and 1.79% respectively, except Germany and Japan. The trend in ICP values indicates stronger bargaining power for Indonesian coffee in international markets supported by branding efforts and adherence to premium quality standards. In this study, the YoY changes in RER of the Indonesian Rupiah (IDR) against the respective currencies (USD, Euro, Ringgit, Ruble, and Yen) also varied with average of 8.63; 11.53; 2.71; 11.53; 2.57; 10.28; 9.93; and 11.53% respectively. The appreciation of the RER against major currencies suggests enhanced economic stability and investor confidence in Indonesia which may have reduced export costs and increased competitiveness. Additionally, the YoY changes in GDPc value also fluctuated with average of 1.51; 1.11; 2.88; 0.73; 1.68; 0.72; 1.34; and 1.23%, respectively. The GDPc trend across destination countries signifies rising purchasing power and consumption capacity further stimulating demand for Indonesian coffee. These dynamics collectively underscore the interplay of market demand, pricing strategies, exchange rate policies, and economic growth in shaping the long-term trends of Indonesia's coffee export performance.

3.2. Year-on-year (YoY) changes of Indonesia coffee yield

Year-on-year (YoY) changes of coffee yield in Indonesia over a 33-year period (1992–2024) exhibited annual fluctuations with average rate of 2.00% (Figure 2). The highest increase in coffee yield which positively influenced the performance of Indonesia's coffee exports occurred in 2002 by 19.56%, while the most significant decline was recorded in 1997 at 8.55%. The increase in coffee yield in Indonesia can be attributed to several key factors. The expansion of coffee cultivation areas, particularly in regions such as Sumatra, Java, and Sulawesi has significantly boosted output. The adoption of improved agricultural practices, including the use of high-yielding varieties, integrated pest management, and enhanced fertilization techniques has contributed to higher productivity.

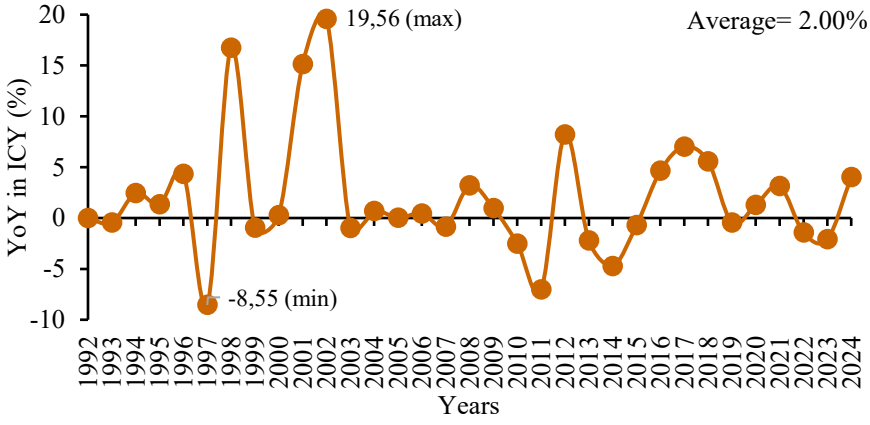

Figure 2. Year-on-year (YoY) changes in Indonesia's coffee yield over a 33-year period (1992–2024). Source: Processed data from BPS-Statistics Indonesia (2025)

Table 2. Year-on-year (YoY) changes in FOB, ICP, RER, and GDPc across eight major export destination countries over a 33-year period (1992–2024)

Years	United States				Germany				Malaysia				Italy			
	FOB	ICP	RER	GDPc	FOB	ICP	RER	GDPc	FOB	ICP	RER	GDPc	FOB	ICP	RER	GDPc
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	47.36	-4.26	2.11	1.41	35.72	-9.50	2.94	-1.63	100.00	-0.93	9.94	7.17	33.33	-21.67	2.94	-0.91
1994	107.15	37.65	4.11	2.76	54.38	15.47	7.36	2.04	50.00	8.96	2.41	6.52	66.67	1.96	7.36	2.13
1995	17.24	18.82	4.03	1.47	-6.82	20.10	8.83	1.25	33.33	35.93	-12.00	7.09	20.00	21.79	8.83	2.89
1996	41.18	-15.10	3.30	2.57	9.76	-16.93	0.25	0.51	25.00	29.62	1.05	7.21	-12.50	3.86	0.25	1.24
1997	12.50	19.83	134.97	3.20	-12.22	-3.36	37.00	1.64	20.00	2.21	11.40	4.63	4.76	-7.94	37.00	1.78
1998	6.48	-8.27	58.56	3.27	10.13	0.25	293.92	2.00	16.67	-26.68	43.94	-9.67	9.09	1.47	293.92	1.78
1999	-47.83	-9.02	-5.68	3.60	-33.33	-15.35	-37.94	1.82	14.29	28.85	-35.01	3.58	4.17	-6.69	-37.94	1.61
2000	-15.03	0.58	16.57	2.93	-35.69	-17.25	-9.36	2.77	80.77	29.77	9.32	6.36	-33.18	-13.95	-9.36	3.74
2001	-17.65	-10.43	19.90	-0.04	-50.68	-7.07	12.98	1.51	-23.54	23.53	19.89	-1.67	-54.97	-2.48	12.98	1.89
2002	19.92	-5.50	-20.43	0.76	56.43	3.80	-8.79	-0.37	17.42	6.03	-20.43	3.22	18.97	5.54	-8.79	0.10
2003	9.14	0.00	-6.03	1.92	30.25	16.48	1.67	-0.76	-22.09	-18.26	-3.56	3.69	99.15	19.69	1.67	-0.31
2004	43.89	-2.40	5.49	2.90	-0.03	4.72	31.76	1.20	21.68	39.38	5.23	4.70	-14.41	9.87	31.76	19.01
2005	72.74	14.39	12.57	2.53	108.61	21.92	1.02	0.79	13.74	-33.11	10.77	3.28	81.25	2.00	1.02	-15.05
2006	14.34	-1.84	-9.03	1.80	1.23	6.65	-4.56	3.93	70.17	50.88	-6.66	3.52	23.70	2.61	-4.56	1.49
2007	7.12	8.44	0.21	1.04	-3.55	8.31	12.99	3.11	87.98	26.30	11.43	4.24	1.65	11.61	12.99	0.98
2008	3.67	2.88	28.06	-0.82	127.94	9.38	11.36	1.15	73.22	4.54	16.85	2.85	74.33	12.11	11.36	-1.62
2009	-7.01	2.80	-0.37	-3.45	-37.11	-7.41	-4.62	-5.45	-22.03	-14.40	-2.63	-3.29	-12.39	-2.41	-4.62	-5.71
2010	9.38	6.54	-21.95	1.86	-1.34	0.21	-14.44	4.34	50.04	43.32	-10.61	5.62	-18.60	-4.43	-14.44	1.40
2011	55.64	32.74	-2.62	0.81	-34.67	7.14	1.69	5.87	53.28	27.57	-0.17	3.67	33.62	16.08	1.69	0.53
2012	20.62	9.44	5.77	1.53	65.75	-7.06	0.26	0.23	19.10	9.77	-25.32	3.96	11.91	-0.35	0.26	-3.24
2013	-37.47	-4.05	26.27	1.14	4.47	19.20	31.55	0.16	9.96	12.34	72.16	3.27	19.33	5.89	31.55	-2.97
2014	42.92	-8.44	1.81	1.54	-30.83	1.24	-2.97	1.78	-26.12	-6.85	0.13	4.60	-21.38	-1.56	-2.97	-0.92
2015	-5.01	-5.41	18.30	1.95	4.68	-9.44	0.93	0.62	23.29	1.15	-12.61	3.69	38.53	-15.48	0.93	0.88
2016	-3.98	-6.99	-5.57	0.93	2.01	-2.51	-7.15	1.41	0.11	5.64	4.55	3.04	-20.95	-0.40	-7.15	1.47
2017	-5.02	1.37	-1.92	1.61	15.31	5.74	7.08	2.30	21.81	4.93	-1.25	4.38	19.97	2.95	7.08	1.82
2018	-0.91	-3.37	12.05	2.38	-58.79	2.81	6.29	0.78	-18.99	13.70	8.41	3.44	-32.16	5.87	6.29	1.12
2019	-0.08	-3.69	-6.28	1.82	4.77	-7.10	-9.49	0.83	-15.54	-33.20	-5.93	3.06	11.67	-9.93	-9.49	1.67
2020	-20.28	14.94	4.18	-4.33	10.41	-0.59	11.08	-4.65	-0.84	22.18	4.48	-6.86	-26.64	7.60	11.08	-8.60
2021	-3.75	-7.98	-2.16	5.55	-38.69	-0.59	0.35	2.93	-11.24	3.81	-1.27	1.84	-3.65	-5.46	0.35	7.34
2022	37.88	-16.44	-0.96	2.02	166.25	-55.75	-8.21	3.89	7.79	55.40	-2.74	3.20	14.82	-16.40	-8.21	7.39
2023	-19.75	1.64	4.16	2.38	-59.34	-4.48	1.68	0.35	13.79	27.12	2.95	2.29	-10.58	-7.56	1.68	0.73
2024	42.64	1.61	5.45	0.80	167.70	-3.76	5.02	0.14	101.83	-1.80	-5.30	2.37	-31.60	10.43	5.02	0.33
Average	**12.97**	**1.83**	**8.63**	**1.51**	**14.32**	**-0.75**	**11.53**	**1.11**	**23.78**	**11.45**	**2.71**	**2.88**	**8.91**	**0.75**	**11.53**	**0.73**

Table 2. Continued

Years	Russia				Japan				United Kingdom				Belgium			
	FOB	**ICP**	**RER**	**GDPc**	**FOB**	**ICP**	**RER**	**GDPc**	**FOB**	**ICP**	**RER**	**GDPc**	**FOB**	**ICP**	**RER**	**GDPc**
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	99.04	100.00	15.87	-8.62	-3.22	15.45	17.28	-0.84	214.25	-16.35	2.71	2.24	299.87	-8.85	2.94	-1.35
1994	49.76	50.00	-2.29	-12.54	156.66	0.82	12.28	0.71	127.27	34.60	2.42	3.58	-50.00	23.02	7.36	2.91
1995	34.19	33.33	13.03	-4.12	-17.53	20.63	18.26	2.39	-16.00	21.39	5.81	2.26	100.00	42.69	8.83	2.17
1996	24.88	25.00	23.37	-3.61	-10.24	-14.00	-16.87	2.90	-21.43	-3.19	11.24	2.17	145.01	-17.21	0.25	1.12
1997	20.12	20.00	8.43	1.57	-14.03	-6.69	35.79	0.74	-57.57	11.61	131.82	4.64	-28.58	-1.49	37.00	3.54
1998	16.11	16.67	32.05	-5.14	6.12	-4.92	256.76	-1.54	-7.14	3.49	169.98	2.85	41.44	5.28	293.92	1.74
1999	14.84	14.29	38.18	6.73	-2.88	13.31	-26.88	-0.52	7.69	-7.07	-41.00	2.65	-56.57	-15.27	-37.94	3.31
2000	12.26	12.50	3.92	10.46	-28.13	-15.67	10.68	2.59	-40.57	-9.91	-0.61	3.30	4.80	-9.30	-9.36	3.47
2001	11.35	11.11	3.34	5.55	-32.92	-33.44	-0.88	0.14	-53.71	-8.21	4.60	1.68	-24.87	-6.83	12.98	0.75
2002	9.52	10.00	-17.65	5.18	-2.38	-5.47	-11.94	-0.19	37.57	2.19	-4.61	1.69	33.34	1.67	-8.79	1.25
2003	9.57	9.09	-0.80	7.79	0.70	0.74	2.96	1.32	42.85	10.16	-5.13	2.55	-23.65	18.03	1.67	0.62
2004	8.13	8.33	16.27	7.63	16.18	6.84	16.81	2.15	-9.59	9.15	15.33	1.77	78.48	7.50	31.76	3.12
2005	7.71	7.69	7.96	6.81	15.64	-6.06	2.76	1.79	124.42	1.24	13.39	1.89	121.22	5.94	1.02	1.76
2006	7.33	7.14	-3.43	8.55	49.07	-0.73	-11.71	2.69	-0.57	7.33	-3.20	1.83	-45.70	5.37	-4.56	1.88
2007	6.35	6.67	9.48	8.69	7.20	-0.86	2.51	-1.27	6.64	13.27	11.07	1.48	20.14	13.66	12.99	2.92
2008	6.57	6.25	12.71	5.25	20.43	2.84	31.35	-5.68	78.19	-6.08	-12.76	-1.02	91.70	11.20	11.36	-0.34
2009	5.66	5.88	-23.98	-7.83	-20.73	-27.04	-2.14	4.08	-16.05	-4.99	-17.88	-4.97	183.07	-3.66	-4.62	-2.81
2010	5.78	5.56	-4.78	4.45	21.16	5.27	2.58	0.21	60.66	-1.81	3.81	1.33	-36.71	-1.52	-14.44	1.93
2011	-36.92	10.24	-1.45	4.22	46.95	15.02	5.92	0.00	-0.86	21.15	-2.67	0.67	61.53	25.10	1.69	0.38
2012	71.88	11.23	2.53	3.85	-16.59	2.99	4.26	1.54	1.11	0.95	12.10	0.77	-21.57	-4.32	0.26	0.12
2013	14.48	0.81	17.30	1.54	-29.38	-20.08	-4.94	2.15	10.15	-1.46	19.77	1.21	17.41	0.65	31.55	-0.51
2014	-15.76	-11.97	-5.63	-1.05	-1.52	-6.12	0.18	0.43	-17.88	8.67	5.45	2.24	-28.06	4.97	-2.97	1.64
2015	32.05	-15.95	-28.18	-2.18	3.56	-1.41	4.52	1.67	28.85	-8.03	12.19	1.81	-51.97	4.58	0.93	1.45
2016	-17.42	3.42	-17.18	0.01	-17.58	10.89	-0.70	0.81	-11.32	-13.86	-21.34	1.49	83.93	-10.07	-7.15	0.76
2017	67.47	17.89	12.70	1.71	-4.79	-4.19	6.68	1.76	27.79	4.42	9.01	1.44	9.40	5.03	7.08	1.23
2018	-80.44	-5.87	-1.50	2.82	2.39	-2.52	1.37	0.71	-52.99	8.17	1.52	1.04	-24.76	4.64	6.29	1.38
2019	17.27	-3.52	-4.36	2.24	-18.74	-1.52	1.68	-0.10	56.92	-4.60	-3.74	1.10	88.62	-10.19	-9.49	1.56
2020	111.54	8.85	-2.50	-2.48	-18.39	1.72	1.93	-4.23	4.06	0.84	4.86	-9.60	-14.45	5.10	11.08	-6.13
2021	-59.86	-4.90	-7.14	5.23	17.01	21.00	-3.07	2.09	-35.34	0.85	3.26	7.05	17.07	4.69	0.35	5.84
2022	203.12	2.99	-3.76	-1.86	-9.69	12.38	-6.02	2.62	87.64	-62.75	-4.32	2.90	44.77	-12.56	-8.21	4.24
2023	-61.11	-30.04	11.73	3.89	6.67	-7.47	-6.71	2.18	-64.77	27.07	-3.60	-0.48	-69.90	-21.03	1.68	0.29
2024	503.26	16.01	-19.60	0.76	41.22	-3.97	-5.49	0.30	47.39	5.33	8.18	0.59	492.43	-7.58	5.02	0.38
Average	**33.29**	**10.57**	**2.57**	**1.68**	**4.92**	**-0.98**	**10.28**	**0.72**	**16.90**	**1.32**	**9.93**	**1.34**	**44.16**	**1.79**	**11.53**	**1.23**

3.3. Panel data

Based on the Chow, Hausman, and Lagrange Multiplier tests, the random effects model (REM) was selected as the probability values were 0.0000 (*Table 3*). The REM employed in this analysis is appropriate, as it accounts for both country-specific effects and time-specific effects. This dual consideration ensures that the coefficient estimates remain unbiased, mitigating potential omitted variable bias arising from unobserved country- or time-related factors. The REM regression analysis of factors influencing Indonesia's coffee export performance the following equation:

$$Y = 24{,}740.5126 + 0.2117\,\text{FOB} + 1{,}312.4875\,\text{ICP} - 0.9612\,\text{RER} - 0.2259\,\text{GDPc} - 1.5764\,\text{ICY} \quad \text{(Eq. 2)}$$

Based on the REM regression equation, it can be interpreted that a one-unit increase (of 1,000 US$ and US$/lb) in FOB and ICP leads to a rise in Indonesia's coffee export volume by 0.2117 and 1,312.4875 tons, respectively. Conversely, the RER, GDPc, and ICY exhibits a negative relationship, indicating that a depreciation of the Indonesian rupiah, gross domestic product per capita, and coffee productivity reduce Indonesia's coffee export volume by 0.9612; 0.2259; and 1.5764 tons, respectively.

Table 3. The chow, hausman, and lagrange multiplier tests for model estimation of factors influencing the performance of Indonesian coffee exports to eight destination countries

Panel Data Regression	Statistic	Prob	Model Selected	Final Model
Chow test	64.4095	0.0000	FEM	
Hausman test	0.0000	1.0000	REM	REM
Lagrange Multiplier (Breusch-Pagan)	66.3278	0.0000	REM	
Random Effect Model (REM)				
Variables	Coefficient			
Constant	24,740.5126			
FOB	0.2117			
ICP	1,312.4875			
RER	-0.9612			
GDPc	-0.2259			
ICY	-1.5764			

3.4. Classical assumptions

The multicollinearity test revealed that all independent variables had Variance Inflation Factor (VIF) values below 10, indicating the absence of multicollinearity (*Table 4*). Similarly, the heteroscedasticity test showed that the probability values of FOB, ICP, RER, GDPc, and ICY were exhibited non-heteroscedasticity as their probability values exceeded 0.05. The DW value was 1.7870, falling within the non-autocorrelation range. The tests for multicollinearity, heteroscedasticity, and autocorrelation confirm that the data meet the assumptions required for further statistical analysis.

Table 4. Multicollinearity, heteroscedasticity, and autocorrelation tests of factors affecting the performance of Indonesian coffee exports to eight destination countries

Variables	Multicollinearity test	Heteroscedasticit test	Autocorrelation test
	VIF	Prob	DW value
FOB	1.5408	0.5517	
ICP	1.6643	0.9256	
RER	2.8025	0.0590	1.7870
GDPc	6.8522	0.9729	
ICY	5.3275	0.3735	

3.5. Statistical test

The FOB, ICP, RER, GDPc, and ICY exhibited a concurrent and highly significant (probability less than 0.01) on the performance of Indonesia's coffee exports to eight destination countries (Tabel 5). Individually, FOB and

ICP values significantly and positively contributed to improved coffee export performance. Conversely, RER, GDPc, and ICY had an insignificant impact on the performance of Indonesian coffee export. The coefficient of determination (R^2) indicates that 12.56% of the variation in Indonesia's coffee export performance to these eight countries can be explained by the combined influence of FOB, ICP, RER, GDPc, and ICY. The low coefficient of determination suggests that other critical factors influencing coffee exports may have been excluded from the model, such as non-tariff policies in destination countries, consumer preferences, taxation, geographical distance, international coffee prices, and competition from other exporting countries.

Table 5. Statistical test of factors influencing the performance of Indonesian coffee exports to eight destination countries

Variables	F-test		t-test		R^2
	Value	Prob	Value	Prob	
FOB			5.5627	0.0000**	
ICP			2.0919	0.0374*	
RER	8.5562	0.0000**	-1.9304	0.0547ns	12.56%
GDPc			-0.6113	0.5416ns	
ICY			-0.0986	0.9216ns	

Note: * and **indicated significant at $P<0.05$ and $P<0.01$; ns= not significant

Based on the regression equation and t-test results, the Free on Board (FOB) value had a positive and significant effect on the performance of Indonesia's coffee exports to eight target countries with a coefficient value of 0.2117 and a probability of 0.0000 (less than 5%). This indicates that a one-unit increase (of 1,000 US$) in FOB value raises Indonesia's coffee export performance by 0.2117 tons across the eight markets. These findings align with Sihombing et al. (2020), who reported that FOB values contributed to the growth of coffee export performance from North Sumatra to the United States, Malaysia, and Japan with a growth rate of 9.38%. Fiankor et al. (2024) further highlighted that variations in FOB export prices across destination countries may arise from differences in per-unit trade costs and exporters' ability to adjust markups and product quality. The FOB value plays a pivotal role in shaping coffee prices in the global market. Higher FOB values reflect increasing global demand for Indonesian coffee driven by its unique quality, competitive pricing, improvements in trade agreements, and export infrastructure. Enhancing FOB value through unique coffee quality and competitive pricing strategies can be achieved by: (1) adopting international quality standards such as those set by the Specialty Coffee Association (SCA), Fair Trade, and Organic Certification which raises coffee prices to premium level (Murray-Prior et al., 2008; Minten et al., 2018); (2) implementing Good Agricultural Practices (GAP) training for coffee farmers, covering superior varietals, soil fertility management, integrated pest control, and effective cherry harvesting techniques (Melese and Kolech, 2021; Marbun et al., 2020; Marbun et al., 2023; Rokhmah et al., 2023); (3) strengthening branding for Indonesia's specialty coffees, such as Lintong, Tapanuli Utara, Sidikalang, Mandailing, Sipirok, Simalungun, and Karo, collectively recognized as Sumatera Specialty Coffees (Pane and Khaliqi, 2022), alongside other regional coffees like Gayo (Aceh), Toraja (South Sulawesi), Flores (East Nusa Tenggara), Kintamani (Bali), and Bondowoso (East Java); and (4) applying controlled fermentation and precision roasting technologies to enhance flavor profiles (Wu et al., 2023), thereby attracting more consumers in export markets. Additionally, improving FOB value through trade agreement strategies can involve: (1) expanding market access via frameworks like the ASEAN Free Trade Area (AFTA) and Comprehensive Economic Partnership Agreements (CEPA) with the EU, and others to eliminate tariffs and import duties enhancing price competitiveness (Wong et al., 2017; Limenta, 2022); (2) fostering international logistics partnerships to streamline processes, reduce transport costs, and implement advanced logistics solutions (Pajic et al., 2024); (3) engaging with government representatives to advocate for double taxation exemptions in trade agreements (Ogbologu, 2024); and (4) collaborating with stakeholders, like coffee producers, exporters, and trade associations to form coalitions addressing non-tariff barriers like quotas, import licensing, and technical standards (Mohan et al., 2013). Export infrastructure improvements can further elevate FOB value by: (1) upgrading logistics infrastructure (e.g., export ports, toll roads, and railways) to ensure efficient distribution from production centers to ports (Ceha et al., 2020; Lima and Lee, 2023); (2) developing cold storage and modern processing facilities in coffee-producing regions to preserve quality (Cuadra and Rydberg, 2006); (3) investing in digital traceability and certification technologies to bolster global buyer confidence (Pradana et al., 2023); (4) conducting capacity-building programs on post-harvest

handling, grading, and global market-compliant packaging (Tesfa, 2019); and (5) providing export financing through credit institutions offering loans and guarantees to support market access (Wanzala et al., 2024). Thus, elevating FOB value through quality enhancement, trade agreement optimization, and export infrastructure strengthening can significantly boost Indonesia's coffee export performance.

Panel regression and t-test results indicate that Indonesia Coffee Prices (ICP) had a positive and statistically significant effect on Indonesia's coffee export performance to eight destination countries with a coefficient and probability value of 1,312.4875 and 0.0374 (less than 5%). This indicates that one-US$/lb increase in ICP value, Indonesia's coffee export performance rise by 1,312.4875 tons across these markets. Higher coffee prices improve export revenues, incentivizing producers to enhance production quality and expand market reach. Additionally, competitive pricing in the international market strengthens Indonesia's position as a key coffee exporter, attracting greater demand from foreign buyers. These findings align with previous studies: Desnky et al. (2018) reported that ICP growth (8.81%) positively influenced coffee exports to the United States from 2000 to 2015. Similarly, Fatkurrohim et al. (2022) found that coffee prices significantly improve export performance with price competitiveness, product quality, and streamlined export procedures being key drivers for *Coffea arabica* exporters. Prasetyani et al. (2022) also noted that a rise in international coffee prices increases Indonesia's export performance by 1.62% reinforcing the critical role of pricing in global trade. In addition, strengthening the price of Indonesian coffee can be achieved through several strategic steps: (1) implementing certification and sustainability standards, (2) improving quality and consistency, (3) digital marketing and branding, (4) expanding market access, and (5) government and institutional support. The adoption and promotion of certifications such as Fairtrade, Rainforest Alliance, and organic labels can help differentiate Indonesian coffee in the global market (Raynolds et al., 2007; Tucker and Zelaya, 2023). These certifications often command premium prices due to consumer willingness to pay more for sustainably produced coffee (Berihun and Gutema, 2025). Dietz et al. (2020) further note that combining multiple certifications can diversify export channels and potentially enhance economic benefits, though the associated costs and efforts must be managed effectively. The price of Indonesian coffee can also be elevated through improved quality and consistency. Establishing and adhering to stringent quality standards, such as ISO 9001:2015 (Iskandar et al., 2020) can reduce price volatility and ensure higher market valuations. Implementing computerized quality assessment methods, such as the Electronic-Based Information Flow Model (Sembiring et al., 2022) can maintain consistency and enhance communication between farmers and coffee collectors. Lubis and Lubis (2024); Irjayanti et al. (2025) emphasize that adopting production technologies and optimizing processes can improve coffee quality and yield, ultimately leading to higher market prices. Digital marketing and branding strategies are also critical for enhancing the value of Indonesian coffee. Leveraging digital platforms, such as social media, websites, and e-commerce can strengthen brand image and reach broader audiences (Dahlan et al., 2023). In addition, promoting the uniqueness of Indonesian coffee origins through geographical indications can enhance market appeal and attract premium buyers (Hartati et al., 2023). Similarly, expanding market access by entering new export markets while strengthening existing ones can help stabilize prices and reduce dependence on a few markets (Darmi et al., 2020). Government support also plays a significant role in determining Indonesian coffee prices. Lubis and Lubis (2024) suggest that government policies, such as subsidies, training programs, and infrastructure development can improve production efficiency and market competitiveness. Furthermore, addressing high bank interest rates and providing financial literacy programs could contribute to higher coffee prices (Sumani et al., 2022). Strengthening agricultural cooperatives is another crucial strategy as they facilitate the implementation of quality standards and certifications thereby improving farmers' bargaining power and access to better market opportunities (Nugroho et al., 2019). The increase in Indonesian coffee prices has reinforced export performance to eight key destination countries. Thus, strategies such as certification, quality enhancement, digital marketing, market expansion, and government support must be optimized to maintain Indonesia's competitive position in the global market.

4. Conclusion

The variation in Indonesia's coffee export performance to eight destination countries was 12.56% influenced simultaneously by the Free on Board (FOB), Indonesia's Coffee Prices (ICP), Rupiah Exchange Rate (RER), Gross Domestic Product per capita (GDPc), and Indonesia Coffee Yield (ICY) variables. The REM regression analysis indicates that a one-unit increase (of 1,000 US$ and US$/lb) in FOB and ICP corresponds to an increase in Indonesia's

coffee export volume by 0.2117 and 1,312.4875 tons. The FOB and ICP values partially had a positive and significant effect on increasing the performance of Indonesia coffee exports. For suggestions, the government and stakeholders enhance product quality, strengthen the branding of Indonesian coffee in the global market, and mitigate trade barriers such as logistics costs and import tariffs imposed by destination countries. Furthermore, export market diversification and the utilization of trade agreements could help stabilize FOB in the long term. Regarding ICP, the Indonesian government is actively working to elevate domestic coffee prices through various initiatives, including cooperative programs, financial support, and specialty coffee promotion. Policy reforms are essential to address challenges such as low financial literacy and market volatility. By improving infrastructure, market access, and financial assistance, the government can help stabilize coffee prices and strengthen the economic prospects of coffee farmers in Indonesia.

Although this study provides insights into the factors influencing Indonesia's coffee export performance, it has several limitations. This study may not encompass all relevant variables affecting coffee exports, such as non-tariff policies in destination countries, consumer preferences, taxation, geographical distance, international coffee prices, and competition from other exporting countries. Additionally, the data were limited to eight export destination countries, which may restrict the generalizability of the findings. These limitations present opportunities for further research, such as incorporating additional variables through more advanced analytical methods (e.g., Revealed Comparative Trade Advantage or Export Competitiveness Index) and expanding the scope to include more export destinations. Future studies could also evaluate the effectiveness of government policies in supporting price stability and enhancing the quality of Indonesian coffee in the global market.

Acknowledgement

Abbreviations

FOB (Free on Board), ICP (Indonesia's Coffee Prices), RER (Rupiah Exchange Rate), GDPc (Gross Domestic Product per capita), ICY (Indonesia Coffee Yield).

Ethical Statement

There is no need to obtain permission from the ethics committee for this study.

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this article.

Authorship Contributions

Concept: Marbun, P. M. P., Sihombing, F. N., Tampubolon, K.; Design: Marbun, P. M. P., Sihombing, F. N., Tampubolon, K.; Data Collection or Processing: Marbun, P. M. P., Sihombing, F. N.; Statistical Analyses: Lahay, R. R., Tampubolon, K.; Literature Search: Lahay, R., Tampubolon, K.; Writing, Review and Editing: Marbun, P. M. P., Sihombing, F. N., Lahay, R., Tampubolon, K.

References

Arfah, A. and Putra, A. H. P. K. (2020). Factors affecting the export of coffee in South Sulawesi Province. *Point of View Research Economic Development,* 1(3): 39-50. https://www.journal.accountingpointofview.id/index.php/POVRED/article/view/99

Ariefianto, D. (2012). Econometrics (Essence and application using eviews). Erlangga Publisher, Indonesia.

Berihun, T. and Gutema, P. (2025). The economic impact of sustainability standards on smallholder coffee producers: Evidence from Ethiopia. *Sustainable Production and Consumption*, 55: 268-284. https://doi.org/10.1016/j.spc.2025.02.022

BPS-Statistics Indonesia. (2025). Statistical yearbook of Indonesia 2025. https://www.bps.go.id/en/publication/2025/02/28/8cfe1a589ad3693396d3db9f/statistical-yearbook-of-indonesia-2025.html (Accessed Date: 17.10.2022).

Ceha, R., Dzikron, M., Muhamad, C. R., Farash, M. and Riyanto, S. (2020). The model for determining location of export coffee's warehouse distribution in West Java. *International Conference on Innovation in Research*, 28–29 August, P.1-13, Bali, Indonesia.

Cuadra, M. and Rydberg, T. (2006). Emergy evaluation on the production, processing and export of coffee in Nicaragua. *Ecological Modelling*, 196(3-4): 421-433. https://doi.org/10.1016/j.ecolmodel.2006.02.010

Dahlan, O. P., Dahlan, S. P. and Fahlevi, M. (2023). Marketing mix elements on customer service satisfaction at coffee shops in Jakarta. *The 8th International Conference on Energy, Environment, Epidemiology and Information System (ICENIS 2023)*, 8-9 August, P.1-13, Semarang, Indonesia.

Danilevicz, I. M., Reisen, V. A. and Bondon, P. (2024). Expectile and M-quantile regression for panel data. *Statistics and Computing*, 34: 97. https://doi.org/10.1007/s11222-024-10396-7

Darmi, A., Rahmanta. and Ayu, S. F. (2020). Price transmission of Arabica coffee (*Coffea arabica*) between Sumatera Utara and major export destination countries in Asia and Australia. *The 3rd International Conference on Agriculture, Environment and Food Security (AEFS 2019)*, 10 February, P.1-7, Medan, Indonesia.

Desnky, R., Syaparuddin. and Aminah, S. (2018). Indonesian coffee exports and the factors influencing. *e-Jurnal Perdagangan Industri dan Moneter,* 6(1): 23-34. https://doi.org/10.22437/pim.v6i1.4656 (In Indonesian).

Dietz, T., Estrella Chong, A., Grabs, J. and Kilian, B. (2020). How effective is multiple certification in improving the economic conditions of smallholder farmers? Evidence from an impact evaluation in Colombia's coffee belt. *The Journal of Development Studies*, 56(6): 1141-1160. https://doi.org/10.1080/00220388.2019.1632433

Farlian, T. and Masthura, Z. (2021). Analysis of factors affecting the volume of coffee export in Central Aceh to the United States. *Agriekonomika,* 10(2): 169-172. https://doi.org/10.21107/agriekonomika.v10i2.10751 (In Indonesian).

Fatkurrohim., Hanani, N. and Syafrial. (2022). The impact of input and output prices on Indonesian coffee production and trade performance. *Habitat,* 33(01): 33-43. https://doi.org/10.21776/ub.habitat.2022.033.1.4

Fiankor, D. D. D., Dalheimer, B., Curzi, D., Hoffmeister, O. and Brümmer, B. (2024). Does it matter how we ship the good apples out? On specific tariffs, transport modes, and agricultural export prices. *Agricultural Economics*, 55(3): 498-514. https://doi.org/10.1111/agec.12829

Gujarati, D. N. (2007). Fundamentals of econometrics. Erlangga Publisher, Indonesia.

Gujarati, D. N. and Porter, D. C. (2009). Basic Econometrics. 5th edition. Tata McGraw-Hill Education, New York, U.S.A.

Gürbüzer, G. B. and Çiftci, F. (2025). Projections of agricultural product exports and their impacts on rural development. *Journal of Tekirdag Agricultural Faculty*, 22(2): 574-588. https://doi.org/10.33462/jotaf.1619704

Hartati, D. S., Oktaviarni, F. and Windarto, W. (2023). Rethinking the future of Indonesian coffee: Legal, social, and political perspectives. *Jambe Law Journal*, 6(1): 69-84. https://doi.org/10.22437/jlj.6.1.69-84

Hasanah, R. U. and Prasetyanto, P. K. (2022). Analysis of the factors influencing Indonesia's coffee exports in 2000-2020. *Journal of Humanities, Social Sciences and Business,* 2(1): 63-74. https://doi.org/10.55047/jhssb.v2i1.378

Honoré, B. E. and Kesina, M. (2017). Estimation of some nonlinear panel data models with both time-varying and time-invariant explanatory variables. *Journal of Business & Economic Statistics*, 35(4): 543-558. https://doi.org/10.1080/07350015.2015.1123635

Irjayanti, M., Azis, A. M., Susilawati. and Sobari, A. R. (2025). Transformative innovations igniting coffee supply chain process efficiency. *Journal of Innovation and Entrepreneurship*, 14(1): 44. https://doi.org/10.1186/s13731-025-00486-9

Iskandar, R., Rizal. and Halimah, N. (2020). Quality management system implementation of ISO 9000: 2015 on robusta coffee processing in Jember Regency. *The 2nd International Conference on Food and Agriculture*, 2-3 November, P.1-9, Bali, Indonesia.

Lima, U. M. and Lee, K. (2023). Governance and asymmetry in global value chains of the coffee industry: Possibility for catch-up by emerging economies. *Seoul Journal of Economics*, 36(1): 79-111. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4372460

Limenta, M. (2022). Toward an ASEAN-EU FTA: examining the trade and sustainable development chapter in the prospective Indonesia-EU CEPA. *Legal Issues of Economic Integration*, 49(2): 191-216. https://doi.org/10.54648/leie2022009

Lubis, S. N. and Lubis, A. A. R. D. (2024). Enhancing Indonesian coffee trade: Strategies for navigating and reducing trade barriers. *International Journal of Innovative Research and Scientific Studies*, 7(3): 1248-1267. https://doi.org/10.53894/ijirss.v7i3.3231

Macedo, A., Gouveia, S. and Rebelo, J. (2019). Does wine quality have a bearing on exports?. *Agris On-line Papers in Economics and Informatics*, 11(4): 49-59. https://doi.org/10.7160/aol.2019.110405

Marbun, P., Bintang., Tampubolon, K., Sihombing, F. N., Simanjuntak, D. R., Irly, I. and Sinuraya, M. (2023). Identification of soil physicochemical, land suitability, and its relationship to *Coffee arabica* yielding based on plant age groups. *Coffee Science,* 18: e182123. https://doi.org/10.25186/.v18i.2123

Marbun, P., Nasution, Z., Hanum, H. and Karim, A. (2020). Classification, physicochemical, soil fertility, and relationship to *Coffee robusta* yield in soil map unit selected. *Coffee Science,* 15: e151818. https://doi.org/10.25186/.v15i.1818

Melese, Y. Y. and Kolech, S. A. (2021). Coffee (*Coffea arabica* L.): Methods, objectives, and future strategies of breeding in Ethiopia. *Sustainability,* 13(19): 10814. https://doi.org/10.3390/su131910814

Ministry of Agriculture (2023). Coffee plantation commodity outlook book. Ministry of Agriculture, P.1-99, Indonesia.

Minten, B., Dereje, M., Engida, E. and Tamru, S. (2018). Tracking the quality premium of certified coffee: evidence from Ethiopia. *World Development*, 101: 119-132. https://doi.org/10.1016/j.worlddev.2017.08.010

Mohan, S., Khorana, S. and Choudhury, H. (2013). Why developing countries have failed to increase their exports of agricultural processed products. *Economic Affairs*, 33(1): 48-64. https://doi.org/10.1111/ecaf.12000

Muhith, A., Susanto, I. H., Rahmalia, D., Adzkiya, D. and Herlambang, T. (2022). The analysis of demand and supply of blood in hospital in surabaya city using panel data regression. *Nonlinear Dynamics and System Theory*, 22(5): 550-560.

Murray-Prior, R., Batt, P.J., Dambui, C. and Kufinale, K. (2008). Improving quality in coffee chains in Papua New Guinea. *Acta Horticulturae*, 794: 247-256. https://doi.org/10.17660/ActaHortic.2008.794.30

Nugroho, A. P., Sutiarso, L., Purwantana, B., Puttanto, B. B., Fabianus, R., Latif, A. and Sutyowati, Y. (2019). Design of integrated database of smart coffee enterprise support system for coffee small medium enterprise. *International Conference on Agricultural Technology, Engineering and Environmental Sciences (ICATES 2019),* 21-22 August, P.1-7, Aceh, Indonesia.

O'brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41: 673-690. https://doi.org/10.1007/s11135-006-9018-6

Ogbologu, O. B. (2024). Charting the path to African prosperity: Unravelling the economic dynamics of the African continental free trade agreement. *Nnamdi Azikiwe University Journal of International Law and Jurisprudence*, 15(1): 92-102. https://www.ajol.info/index.php/naujilj/article/view/269105

Pajic, V., Andrejic, M. and Chatterjee, P. (2024). Enhancing cold chain logistics: A framework for advanced temperature monitoring in transportation and storage. *Mechatronics and Intelligent Transportation Systems*, 3(1): 16-30. https://doi.org/10.56578/mits030102

Pane, T. C. and Khaliqi, M. (2022). Consumers' preferences for North Sumatera specialty coffees. *The 5th International Conference on Agriculture, Environment and Food Security (AEFS 2021)*, 18 November, P.1-7, Medan, Indonesia.

Pradana, I. G. M. T., Djatna, T., Hermadi, I. and Yuliasih, I. (2023). Blockchain-based traceability system for Indonesian coffee digital business ecosystem. *International Journal of Engineering*, 36(5): 879-893. https://doi.org/10.5829/ije.2023.36.05b.05

Prasetyani, D. A., Latunteng, W. and Arifin, A. L. (2022). The influence of international coffee prices and the rupiah exchange rate on the volume of Indonesian coffee exports. *Budapest International Research and Critics Institute-Journal,* 5(3): 27155-27168. https://doi.org/10.33258/birci.v5i3.6758

Raynolds, L. T., Murray, D. and Heller, A. (2007). Regulating sustainability in the coffee sector: A comparative analysis of third-party environmental and social certification initiatives. *Agriculture and Human Values*, 24: 147-163. https://doi.org/10.1007/s10460-006-9047-8

Rokhmah, D. N., Supriadi, H. and Heryana, N. (2023). Sustainable specialty coffee production: An agronomy perspective (A review). *4th International Conference of Food Security and Sustainable Agriculture in the Tropics (FSSAT 4),* 15-16 February, P.1-12, Makassar, Indonesia.

Sembiring, M. T., Gurusinga, L. N. and Pasaribu, F. M. (2022). Electronic-based information flow model design as a basis for determining the price of coffee beans in Tanah Karo. *International Journal of eBusiness and eGovernment Studies*, 14(4): 151-173.

Sihombing, F. N., Supriana, T. and Ayu, S. F. (2020). Identifying the factors contributing to the volume of coffee export from North Sumatra to the United States, Malaysia, and Japan. *Caraka Tani: Journal of Sustainable Agriculture,* 36(1): 83-96. https://doi.org/10.20961/carakatani.v36i1.43357

Sumani., Roziq, A., Yuliati, L. and Shulthoni, M. (2022). Financial literation analysis, marketing strategies, and institutional models of coffee farming creation. *Calitatea: Acces la Success; Bucharest,* 23(187): 209-212. https://doi.org/10.47750/QAS/23.187.26

Suryana, A. T., Saleh, Y., Dewi, T. G. and Rahayu, H. S. P. (2024). Global competitiveness of coffee products: A comparative study of Indonesia and Vietnam. *Coffee Science,* 19: e192237. https://doi.org/10.25186/.v19i.2237

Tesfa, M. (2019). Review on post-harvest processing operations affecting coffee (*Coffea arabica* L.) quality in Ethiopia. *Journal of Environment and Earth Science*, 9(12): 30-39.

Trihendradi, C. (2007). A comprehensive look at regression analysis: Strategies for analyzing causal relationships. Andi Publisher, Indonesia.

Tucker, C. M. and Zelaya, M. E. P. (2023). Fostering sustainability through environmentally friendly coffee production and alternative trade: The case of Café Orgánico de Marcala (COMSA), Honduras. *Critique of Anthropology*, 43(3): 231-251. https://doi.org/10.1177/0308275X231194253

USDA (2025). Production Trends-Coffee. https://www.fas.usda.gov/data/production/commodity/0711100 (Accessed Date: 27.06.2025).

Wanzala, R. W., Marwa, N. and Lwanga, E. N. (2024). Impact of agricultural credit on coffee productivity in Kenya. *World Development Sustainability*, 5: 100166. https://doi.org/10.1016/j.wds.2024.100166

Wishanesta, I. K. D. and Setiawina, N. D. (2019). Analysis of factors affecting the export value of Indonesian coffee and competitiveness of the 2002-2017 period. *International Journal of Economics, Commerce and Management,* 7(11): 272-292.

Wong, C. K. K., Liew, V. K. S. and Arip, M. A. (2017). The impact of ASEAN free trade area on Intra-ASEAN manufacturing trade. *International Journal of Business and Society*, 18(3): 633-643. https://doi.org/10.33736/ijbs.3155.2017

Wu, H., Viejo, C. G., Fuentes, S., Dunshea, F. R. and Suleria, H. A. (2023). The impact of wet fermentation on coffee quality traits and volatile compounds using digital technologies. *Fermentation*, 9(1): 68. https://doi.org/10.3390/fermentation9010068