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Analysis of Factors Affecting Indonesian Cocoa Beans Supply, Demand, and Exports

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A B S T R A C T

This study aims to analyze the factors affecting domestic supply, domestic demand, and exports of cocoa beans in Indonesia. The model in this study used simultaneous equations with the analysis method in the form of Two Stage Least Square (2SLS). This research uses secondary data with a time period of 2006 - 2021. The results of this study explain that: (1) Domestic cocoa bean supply is influenced by domestic cocoa bean prices, domestic coffee bean prices, productivity levels, exports, and the previous year's supply. (2) Domestic demand for cocoa beans is influenced by domestic cocoa bean prices, domestic coffee bean prices, exports, and the previous year's demand. (3) Cocoa bean exports are influenced by international prices, exchange rates, domestic cocoa bean supply, and domestic cocoa bean demand. The results of this study are expected to contribute to policy recommendations for the government to maximize the supply, demand, and export of cocoa beans. The limitations of this study lie in the fact that the data was collected via the internet and sourced from several different publications, which may have led to discrepancies in the data for the same year.

Keywords: *Cocoa Beans, Exports, Supply, Demand, Two Stage Least Square*
JEL Classification Code: *Q11, Q17, C36*

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INTRODUCTION

The plantation subsector is one part of the agricultural sector that plays an important role in national development, especially to improve people's welfare and economic development in Indonesia. in 2021, the plantation subsector contributed 3,49% to total GDP and 29,67% to the agricultural sector (BPS, 2022). This figure makes plantations ranked first as the largest contributor to GDP among other agricultural subsectors.

Cocoa is one of the many commodities in the plantation subsector that has a role in national economic development. Cocoa plants (Theobroma cacao L) or often referred to as chocolate plants are one of the commodities that have high economic value and are Indonesia's leading commodities because they can help the community's economy and contribute to foreign exchange (Oktarini, 2021).

Based on FAO data, Indonesia is among the countries that produce the largest cocoa beans in the world. Indonesia ranks third after Côte d'Ivoire and Ghana with total production reaching 728.046 tons in 2021. Indonesia is the only country among the top five largest cocoa bean producing countries in the world located in Southeast Asia, not from Africa. The high production of cocoa beans is thought to be because Indonesia has a tropical climate and is supported by fertile soil conditions.

Indonesia's large cocoa bean yield results in high cocoa bean supply. The amount of cocoa beans produced is related to the supply. Supply itself is the activity of selling a product to consumers at a certain price in order to meet their needs (Venny & Asriati, 2022). In Indonesia, cocoa beans are first offered to domestic producers. The domestic supply of cocoa beans will be influenced by several factors such as the domestic price of cocoa beans, the price of substitutes such as coffee, productivity levels, exports, and the previous year's supply.

The area of cocoa plantation in Indonesia is fluctuating with a downward trend. The largest cocoa plantation area was in 2012 with an area of 1,774,463 ha and experienced a decrease in land area in the following years until 2021. According to the Ministry of Agriculture (2022), the decline in cocoa plantation area is due to more land conversion, especially in Java and Sumatra regions such as Bangka Belitung and Bengkulu provinces. Changes in the increase and decrease in land area and total cocoa production will have an impact on cocoa productivity in Indonesia. The level of cocoa bean productivity is low. This is because the amount of cocoa beans produced is not proportional to the size of the cocoa land area. The existence of this vast cocoa land is not utilized properly, so Indonesia cannot produce cocoa beans optimally.

The quality of cocoa beans exported by Indonesia is low, at grades 3 and 4, due to traditional processing and most are not properly fermented (Nurhadi & Hidayat, 2019). The low quality of cocoa beans has an impact on the price of Indonesian cocoa beans, which is always lower than the world price. In addition to quality, the cause of changes in cocoa bean prices every year is due to fluctuating exchange rate movements, which also have an impact on changes in export volumes (Septyana & Taufiq, 2022).

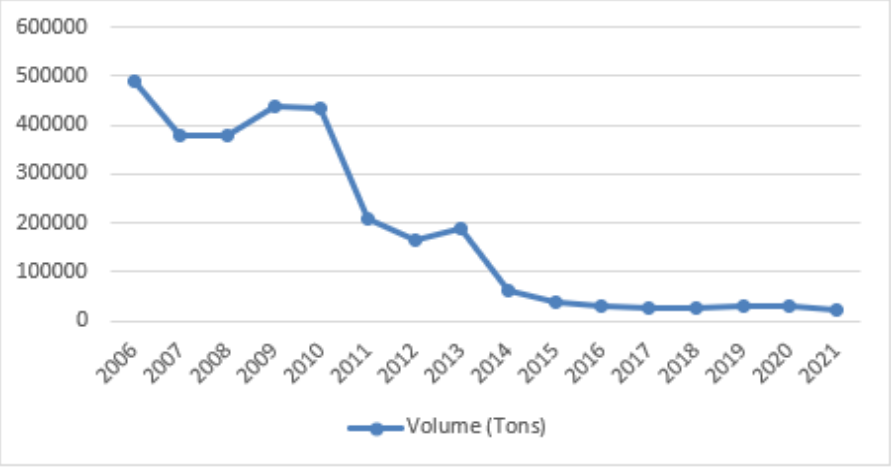
Indonesia has a large demand for cocoa beans. The harvested cocoa beans are first used for the needs of domestic factories and processing industries. This causes a large demand for cocoa beans. Demand is a product or service desired by consumers for their needs and purchased at a certain price level and time (Fauzi et al., 2023). The high demand for cocoa beans in the country is also influenced by a government program regarding the downstreaming of cocoa beans so that they can be processed in the form of butter, liquor, powder, and various processed

foods and beverages (Ramadhani et al., 2023). Domestic demand for cocoa beans can be influenced by the domestic price of cocoa beans, the price of substitutes such as coffee, exports and the previous year's demand.

In this study, coffee beans are a substitute for cocoa beans. Cocoa and coffee plants are commodities from the plantation subsector. The use of these two commodities is as the main raw material in processing a product, especially in the food and beverage sector. The price of coffee beans is relatively lower than the price of cocoa beans. This is because coffee beans can only grow optimally in certain regions, especially in West Africa (Nisa' et al., 2023). Meanwhile, coffee beans can be produced in more countries, which makes the world's supply of coffee beans abundant and affects the price. In addition, cocoa beans have a higher price because after harvesting cocoa beans require extra care such as going through a fermentation process before they can be marketed (Manalu, 2019). In Indonesia, cocoa beans are a commodity that is prioritized to meet domestic demand. Meanwhile, coffee beans are mostly used for export.

The harvest of cocoa beans is not only used to meet domestic demand but also for export. Export is a trade activity between countries where a country sells goods produced domestically to other countries (Rianda, 2020). In this study, exports are affected by international prices, exchange rates, total domestic supply, and total domestic demand. The export volume of cocoa beans tends to decrease from year to year, especially from 2011. Changes in export volume can be seen in Figure 1.

The decline in the export volume of cocoa beans is due to the Minister of Finance Regulation No. 67/PMK.011/2010 which regulates the Determination of Export Goods Subject to Export Duty and Export Duty Tariffs. One of the reasons for this regulation is that the demand for cocoa beans by importing countries is very high, resulting in a lack of supply for domestic industries that use cocoa beans as raw materials. The existence of this regulation succeeded in making cocoa bean exports begin to decline and instead the export of processed cocoa products such as cocoa butter and powder increased (Satria et al., 2021). In addition, the government's downstream program to process cocoa beans into processed products has also caused cocoa bean exports to decline.



Source: UN Comtrade

Figure 1.
Export Volume of Indonesian Cocoa Beans 2006 – 2021

Not many previous studies have discussed the supply of cocoa beans. Based on research by Suciningtyas & Setiawan (2023) on robusta coffee supply, it is explained that coffee price, land area, and technology have a significant influence on coffee supply because the t-statistic value is <0.05. Meanwhile, the price of cloves and production costs each have a t-statistic value of 0.7774 and 0.2136 so they do not have a significant effect on supply. Research by Nurhudayah et al (2018) on maize commodities explains that maize production has a significant effect on supply with a t-statistic value of 0.000 <0.05. Meanwhile, the price of corn and the price of rice have no significant effect on supply with t-statistic values of 0.073 and 0.268, respectively.

In addition, research on red chili commodities explains that simultaneously the supply is influenced by production, the price of raw chili, the price of large red chili, fertilizer prices, average rainfall, and land area. Other research on tobacco commodities explains that the F test value is 0.000 <0.05 so that tobacco supply is simultaneously influenced by price, consumption costs, production costs, and land area (Arofah & Setiawan, 2022). In addition, partially, the variables that have a significant effect on tobacco supply are consumption costs, production costs, and land area. Meanwhile, the price variable has no significant effect on tobacco supply with a t-statistic value of 0.3979.

Research on the demand for coffee beans has been conducted by Satria et al (2021) which examines the factors that influence the demand for the cocoa bean industry. The results of the study explain that the result of the F test is 0.003 so that it is stated that all variables simultaneously affect the demand for the cocoa bean industry. Based on the t-test value, the variables that have a significant effect on demand are cocoa bean price, cocoa butter price, cocoa powder price, and cocoa powder production. While the cocoa butter production variable has a t-statistic value of 0.335 so it does not have a significant effect on demand. Septiadi & Joka (2019) have examined the demand for rice using multiple linear regression methods, the results of the study explain that rice demand is significantly influenced by rice prices, per capita income, population, rice production, and rice demand in the previous year (t-1) with the t test value of all variables below 0.05. Per capita income, population, and previous year's demand (t-1) have a positive effect while rice price and production have a negative effect on Indonesia's rice demand.

Research by Wibowo & Surbakti (2023) on onion commodities explains that domestic price variables and import prices have a coefficient value of -18.813 and -49745.93 which means that every 1% increase in domestic and import prices causes a decrease in onion demand by 18,813 tons and 49,745.93 tons in each variable. While the population and income variables have a positive coefficient value of 0.004 and 0.018 so that when there is a 1% increase in population and income results in an increase in onion demand. Another study conducted by Setianingsih et al (2021) Setianingsih et al (2021) explains that the only variable that has a significant effect on the demand for rice in Gorontalo city is population with a t-test value of 0.001 < 0.05. Meanwhile, other variables, rice price and corn price, have t-statistic values of 0.557 and 0.809 respectively, which are greater than 0.05, so it is stated that they do not have a significant effect on rice demand in Gorontalo city.

Based on research on cocoa exports by Fauzi & Islami (2023) explained that Indonesian cocoa exports to the United States are influenced by production, GDP, and international prices. This study uses a significant level of 10%, so the variable that has a significant relationship to exports is the production variable with a

t-statistic value of 0.0721. Meanwhile, the GDP and international price variables have no significant effect because the t-statistic value > 0.10. Putri & Prihtanti (2020) examined the volume of Indonesian exports in 2007-2017 where he explained that the variable that has a significant influence on Indonesian cocoa exports is domestic prices because the t-statistic value is 0.003 < 0.05. While other variables such as production volume, import prices, exchange rates, and GDP have a t-statistic value> 0.05 so they do not have a significant influence.

Ananda et al (2018) conducted research on factors affecting cocoa exports 2006 - 2015. In his research, he explained that export taxes and exchange rates have a significant influence on cocoa exports because the t-statistic value is < 0.05. Meanwhile, the international price has a t-statistic value of 0.703 > 0.05 so it does not have a significant effect on exports. This is because since the export tax and exchange rate have depreciated, Indonesia has chosen to supply more cocoa domestically (Ananda et al., 2018). Hadi & Setyo (2019) conducted research using the Ordinary Least Square (OLS) analysis method. The result of the study is the F test value of 0.000 < 0.05 so that Indonesian cocoa exports are jointly influenced by international prices, exchange rates, and total production. Partially, all variables also have a significant effect on exports because the results of the t-statistic value <0.05.

Putro & Winandi (2023) in their research entitled Factors Affecting Export of Indonesian Cocoa Beans to Malaysia explained that the factors that significantly affect the volume of Indonesian cocoa bean exports to Malaysia in the long term are production, palm oil export prices, and export duty dummy policies. While the exchange rate has no significant effect because the t-statistic value is 0.3754 > 0.05. Research on other commodities such as those conducted by Hasibuan et al (2023) which examines cabbage vegetable exports in North Sumatra Province explains that partially cabbage vegetable exports are significantly influenced by all variables in the form of GDP, exchange rates, export volumes, and export prices with each t-statistic value of 0.017, 0.000, 0.000, and 0.000.

Other research on tobacco commodities by Nainggolan & Sihotang (2021) explains that the results of the t test on the variables of total production, exchange rates, and interest rates are 0.186, 0.000, and 0.011 respectively so that the variables that have a significant effect on tobacco exports are exchange rates and interest rates because the t-statistic value < 0.05. As for the amount of production, it has no significant effect on tobacco exports because the t-test value is greater than 0.05. Mawardi et al (2021) conducted research with the aim of knowing the factors that influence Indonesia's natural rubber exports to Brazil. The results explained that the GDP variable had a significant effect on natural rubber exports because the t-count value was greater than the t table (2.929698 > 2.17881). While the other two variables natural rubber prices and exchange rates have no significant effect because each t-count value is smaller than the t table.

Cocoa bean supply, demand, and export activities have not been maximized. This is because there are still some problems and obstacles in the implementation process. Therefore, it is necessary to have a government policy to deal with the existing problems in order to maximize the supply, demand, and export activities of cocoa beans. The purpose of this study are: (1) To analyze the factors affecting domestic supply and demand of cocoa beans. (2) To analyze the factors affecting Indonesian cocoa bean exports. Previous studies have never discussed supply, demand, and export of cocoa beans simultaneously. This study will discuss the three variables using the Two Stagel Least Square (2SLS)

method. Some of the variables used in this study are different from previous studies. In addition, this study also uses data in the time span 2006 - 2021 which has never been studied in previous studies.

METHODOLOGY

This research uses secondary data which has a time span of 16 years starting from 2006 to 2021. The data in this study were obtained from UN Comtrade, Central Bureau of Statistic (BPS), the Food and Agriculture Organization (FAO), World Bank, and the Directorate General of Plantations. This study uses a simultaneous equation model approach using the Two Stage Least Square (2SLS) analysis method.

Equation Model

The equation model used in this study is a simultaneous equation model. Simultaneous equations are models that contain several equations where the number of equations used in the study is equal to the number of endogenous variables (Shina, 2018). In simultaneous equations, there is a reciprocal relationship between variables, so that dependent variables can also act as independent variables. This can cause bias between independent variables and dependent variables and lead to endogeneity problems (Wibowo & Surbakti, 2023). To address the issue of endogeneity, the 2SLS method has two stages, namely estimation of endogenous variables and estimation of structural equations. The initial equation model in this study is:

$$\mathrm{QDBK}_t = \mathrm{a}_0 + \mathrm{a}_1\mathrm{HBKD}_t + \mathrm{a}_2\mathrm{HBOD}_t + \mathrm{a}_3\mathrm{TP}_t + \mathrm{a}_4\mathrm{XBK}_{t-1} + U_{2t}$$

$$\mathrm{QDBK}_t = b_0 + b_1\mathrm{HBKD}_t + b_2\mathrm{HBOD}_t + b_3\mathrm{XBK}_t + b_4\mathrm{QDBK}_{t-1} + U_{2t}$$

$$\mathrm{XBK}_t = c_0 + c_1\mathrm{HBKI}_t + c_2\mathrm{NT}_t + c_3\mathrm{QSBK}_t + c_4\mathrm{QDBK}_t + U_{3t}$$

The first stage is the estimation of endogenous variables. This study has three endogenous variables, namely domestic cocoa bean supply (QSBK), domestic cocoa bean demand (QDBK), and cocoa bean exports (XBK). Endogenous variable estimation aims to eliminate endogeneity by replacing endogenous variables with fitted values from regression results. The following is the equation:

$$\widehat{QSBK_t} = \mathrm{a}_0 + \mathrm{a}_1\mathrm{HBKD}_t + \mathrm{a}_2\mathrm{HBOD}_t + \mathrm{a}_3\mathrm{TP}_t + \mathrm{a}_4\mathrm{HBKI}_t + \mathrm{a}_5\mathrm{NT}_t + \mathrm{a}_6\mathrm{QSBK}_{t-1} + \mathrm{a}_7\mathrm{QDBK}_{t-1} + \mathrm{a}_8\mathrm{XBK}_t + U_{1t}$$

$$\widehat{QDBK_t} = b_0 + b_1\mathrm{HBKD}_t + b_2\mathrm{HBOD}_t + b_3\mathrm{HBKI}_t + b_4\mathrm{NT}_t + b_5\mathrm{TP}_t + b_6\mathrm{QDBK}_{t-1} + b_7\mathrm{QSBK}_{t-1} + b_8\mathrm{XBK}_t + U_{2t}$$

$$\widehat{XBK_t} = c_0 + c_1\mathrm{HBKI}_t + c_2\mathrm{NT}_t + c_3\mathrm{HBKD}_t + c_4\mathrm{HBOD}_t + c_5\mathrm{TP}_t + c_6\mathrm{QSBK}_{t-1} + c_7\mathrm{QDBK}_{t-1} + U_{3t}$$

From this equation, the results of the fitted values are symbolized by \widehat QSBK, QDBK dan XBK, which will then be used to replace the original variables when forming the structural equation. Next, in stage 2, the estimation of structural equations aims to insert fitted values to replace endogenous variables in each equation model. The following is the equation model form:

$$QSBK_t = a_0 + a_1\mathrm{HBKD}_t + a_2\mathrm{HBOD}_t + a_3\mathrm{TP}_t + a_4\widehat{XBK_t} + a_5QSBK_{t-1} + U_{1t}$$

$$QDBK_t = b_0 + b_1\mathrm{HBKD}_t + b_2\mathrm{HBOD}_t + b_3\widehat{XBK_t} + b_4QDBK_{t-1} + U_{2t}$$

$$XBK_t = c_0 + c_1\mathrm{HBKI}_t + c_2\mathrm{NT}_t + c_3\widehat{QSBK_t} + c_4\widehat{QDBK_t} + U_{3t}$$

This equation model is then transformed into a natural logarithm form. So, the final form of the equation model used is:

1. Domestic Supply of Cocoa Beans

$$\ln QSBK_t = \ln a_0 + a_1 \ln HBKD_t + a_2 \ln HBOD_t + a_3 \ln TP_t + a_4 \ln XBK_t + a_5 \ln QSBK_{t-1} + U_{1t}$$

where LnQSBK represents the natural logarithm of domestic cocoa bean supply (tons). LnHBKD is the natural logarithm of the real domestic cocoa bean price (Rp/Kg), while LnHBOD denotes the natural logarithm of the real domestic coffee bean price (Rp/Kg). LnTP refers to the natural logarithm of productivity levels (tons/ha). LnXBK indicates the natural logarithm of Indonesian cocoa bean exports (tons), and $LnQSBK_{t-1}$ represents the natural logarithm of cocoa bean supply in the previous year (tons). The parameter a_0 is the constant term, a_i (for i=1,2,3,4,5) denotes the estimated coefficients, and U_1 captures the confounding variables included in the model.

Hypothesis sign: $a_1, a_3 > 0$; $a_2, a_4 < 0$; $0 < a_5 < 1$

2. Domestic Demand of Cocoa Beans

$$\ln QDBK_t = \ln b_0 + b_1 \ln HBKD_t + b_2 \ln HBOD_t + b_3 \ln XBK_t + b_4 \ln QDBK_{t-1} + U_{2t}$$

where LnQDBK denotes the natural logarithm of domestic demand for cocoa beans (tons). LnHBKD represents the natural logarithm of the real domestic cocoa bean price (Rp/Kg), while LnHBOD refers to the natural logarithm of the real domestic coffee bean price (Rp/Kg). LnXBK indicates the natural logarithm of Indonesian cocoa bean exports (tons). $LnQDBK_{t-1}$ is the natural logarithm of the previous year's cocoa bean demand (tons). The parameter b_0 serves as the constant term, b_i (for i=1,2,3,4) represents the estimated coefficients, and U_2 captures the confounding variables included in the model.

Hypothesis sign: $b_2 > 0$; $b_1, b_3 < 0$; $0 < b_4 < 1$

3. Indonesian Cocoa Bean Exports

$$\ln XBK_t = \ln c_0 + c_1 \ln HBKI_t + c_2 \ln NT_t + c_3 \ln QSBK_t + c_4 \ln QDBK_t + U_{3t}$$

where LnXBK represents the natural logarithm of Indonesian cocoa bean exports (tons). LnHBKI denotes the natural logarithm of the real international cocoa bean price (USD/tons), while LnNT refers to the natural logarithm of the real rupiah–US dollar exchange rate (Rp/USD). LnQSBK indicates the natural logarithm of total domestic cocoa bean supply (tons), and LnQDBK represents the natural logarithm of total domestic cocoa bean demand (tons). The parameter c_0is the constant term, whereas c_i(for i=1,2,3,4) denotes the estimated coefficients. Finally, U_3captures the confounding variables present in the model.

Hypothesis sign: $c_1, c_3 > 0$; $c_2, c_4 < 0$

Model Identification

Model identification that follow order condition requirements in order to determine whether the equations used in the study are identifiable or not. The order condition test method has the following criteria:

a. (K – M) < (G – 1), then the equation is underidentified and cannot use the analysis method in the simultaneous equation model

b. If (K – M) = (G – 1), then the equation is exactly identified and can use the Indirect Least Square (ILS) method

c. If (K – M) > (G – 1), then the equation is overidentified and can use the Two Stage Least Square (2SLS) method

where K is Total number of variables in the model (endogenous and exogenous), M is Number of exogenous variables in a particular equation in the model, and G is Total number of equations in the model.

Table 1.
Order Condition Results

Equations	K	M	G	(K – M)	(G – 1)	Description
Domestic supply	10	5	3	5	2	*Overidentified*
Domestic demand	10	4	3	6	2	*Overidentified*
Export	10	4	3	6	2	*Overidentified*

Source: Data Processed, 2024

Classical Assumption Test

The equation model will be considered valid if it meets the classical assumption requirements. The classical assumption test in this study consists of four stages, namely the residual normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test.

The first stage is the residual normality test, which aims to determine whether the distribution of the residual values used is normal. The residual normality test uses the Kolmogorov Smirnov test. The test criteria are:

H_0 : probability value > 0,05, then the residuals are normally distributed.

H_1 : probability value ≤ 0,05, then the residuals are not normally distributed.

The second stage is the multicollinearity test, which aims to determine whether there is a high correlation between the independent variables in the equation. Multicollinearity test uses tolerance value or Variance Influenced Factor (VIF). The test criteria are if the tolerance value <0,10 or VIF > 10 then multicollinearity occurs. Meanwhile, if the tolerance value > 0,10 or VIF ≤ 10 then there is no multicollinearity.

The third stage is the heteroscedasticity test, which aims to determine whether there is a variance in the residuals in the equation model. The heteroscedasticity test uses the Glejser test. The test criteria are:

H_0 : probability value > 0,05, therefore no heteroscedasticity

H_1 : probability value ≤ 0,05, therefore heteroscedasticity

The fourth stage is the autocorrelation test, which aims to determine whether there is a correlation between the disturbance parameters in a certain period and the previous period. The autocorrelation test uses the LM (Lagrange Multiplier) test with the Brusch Godfrey method. The test criteria are:

H_0 : probability value > 0.05, therefore no autocorrelation

H_1 : probability value ≤ 0.05, therefore autocorrelation

Model and Hypothesis Testing

Testing of the 2SLS method model aims to prove the previously formulated hypothesis. The testing consists of three stages tested using IBM SPSS to provide accurate results. The first stage is the coefficient of determination (R2). The coefficient of determination has a range of 0 < R2 < 1. If the R2 value is close to one, the independent variable can explain the diversity of the dependent variable, whereas if the R2 value is close to zero, the independent variable cannot explain the diversity of the dependent variable (Rambe & Kusnadi, 2018).

The second stage is the F test, which aims to determine whether the independent variables simultaneously influence the dependent variable (Putri et al., 2021). The testing criteria are:

H_0 : probability value > 0,05, then the independent variables simultaneously have no significant effect on the dependent variable

H_1 : probability value ≤ 0,05, then the independent variables simultaneously have a significant effect on the dependent variable

The third stage is the t test, which is used

to determine how each independent variable relates to the dependent variable. The testing criteria are:

H_0 : probability value > 0,05, then the independent variable partially has no significant effect on the dependent variable.

H_1 : probability value ≤ 0,05, then the independent variable partially has a significant effect on the dependent variable.

The coefficient values from the Two Stage Least Square (2SLS) test results are used to determine the short-term and long term elasticity of domestic cocoa bean supply and demand. Short term and long term formulated as follows:

$$ESR = b\frac{\overline{X}}{\overline{Y}}$$

where ESR is short run elasticity, b is coefficients of exogenous variables, X is Avarage of exogenous variables, and Y is Avarage of endogenous.

$$ELR = \frac{ESR}{1 - an}$$

where ELR is long run elasticity, ESR is Short run elasticity, and an is previous year coefficient (t-1)

The test criterion is if the elasticity value is greater than one (E > 1), it is stated that the demand or supply of cocoa beans is elastic, which means that the endogeneous variable is responsive to changes in the exogeneous variable. Meanwhile, if the elasticity value is smaller than one (E < 1), it is stated that the demand or supply of cocoa beans is inelastic, which means that the endogenous variable is not responsive to changes in the exogenous variable.

Operational Definition

The variables used in this study are explained as follows: (1) Domestic supply is the amount of cocoa beans offered by Indonesia to the domestic processing industry. (2) Domestic demand is the amount of cocoa beans demanded by the domestic processing industry for reprocessing. (3) Export is the activity of marketing cocoa beans abroad. (4) Cocoa bean price is the price of cocoa beans at the farm level based on the prevailing price in the Indonesian market. (5) International cocoa bean price is the price of cocoa beans calculated by dividing the total export value of cocoa beans by the export volume of cocoa beans in the same year. (6) Domestic coffee bean price is the farm-gate price of coffee beans based on the prevailing price in the Indonesian market. (7) Productivity is the ability of land to produce cocoa beans. (8) Exchange rate is the ratio of the rupiah to the US dollar prevailing each year. (9) Domestic supply t-1 is the amount of cocoa beans offered by Indonesia in the previous year. (10) Domestic demand t-1 is the amount of cocoa beans demanded by the domestic processing industry in the previous year.

RESULTS AND DISCUSSION

Classic Assumption Test Results

The first stage of classical assumption test in this study is residual normality test. This test used the Kolmogorov Smirnov test. Based on the test results, it is known that the supply, demand, and cocoa bean export equation models have a significance value of more than 0,05, so H0 is

Table 2.
Residual Normality Test Results

Model	Asymp. Sig. (2-tailed)	Results
Cocoa Bean Supply	0,893	Normally distributed
Cocoa Bean Demand	0,270	Normally distributed
Cocoa Bean Exports	0,953	Normally distributed

Source: Data Processed, 2024

Table 3.
Multicollinearity Test Results

Model	*Collinearity Statistics*		Results
	Tolerance	VIF	
Domestic Cocoa Bean Supply			
Domestic cocoa bean prices	0,135	7,412	No multicollinearity
Domestic coffee bean prices	0,109	9,194	No multicollinearity
Productivity level	0,456	2,193	No multicollinearity
Cocoa bean exports	0,194	5,152	No multicollinearity
Previous year's supply	0,543	1,840	No multicollinearity
Domestic Cocoa Bean Demand			
Domestic cocoa bean prices	0,169	5,931	No multicollinearity
Domestic coffee bean prices	0,108	9,291	No multicollinearity
Cocoa bean exports	0,190	5,277	No multicollinearity
Previous year's demand	0,132	7,584	No multicollinearity
Cocoa Bean Exports			
International prices	0,817	1,224	No multicollinearity
Exchange rate	0,307	3,253	No multicollinearity
Domestic cocoa bean supply	0,762	1,313	No multicollinearity
Domestic cocoa bean demand	0,311	3,211	No multicollinearity

Source: Data Processed, 2024

Table 4.
Heteroscedasticity Test Results

Model	Sig.	Results
Domestic Cocoa Bean Supply		
Domestic cocoa bean prices	0,349	No heteroscedasticity
Domestic coffee bean prices	0,288	No heteroscedasticity
Productivity level	0,425	No heteroscedasticity
Cocoa bean exports	0,360	No heteroscedasticity
Previous year's supply	0,731	No heteroscedasticity
Domestic Cocoa Bean Demand		
Domestic cocoa bean prices	0,869	No heteroscedasticity
Domestic coffee bean prices	0,429	No heteroscedasticity
Cocoa bean exports	0,618	No heteroscedasticity
Previous year's demand	0,901	No heteroscedasticity
Cocoa Bean Exports		
International cocoa bean prices	0,401	No heteroscedasticity
Exchange rate	0,986	No heteroscedasticity
Domestic cocoa bean supply	0,954	No heteroscedasticity
Domestic cocoa bean demand	0,612	No heteroscedasticity

Source: Data Processed, 2024

Table 5.
Autocorrelation Test Results

Model	Sig.	Results
Lag domestic cocoa bean supply	0,062	No autocorrelation
Lag domestic cocoa bean demand	0,924	No autocorrelation
Lag cocoa bean exports	0,527	No autocorrelation

Source: Data Processed, 2024

accepted and H1 is rejected. This means that the three equation models in this study are declared to be normally distributed.

The second stage is the multicollinearity test. This test is obtained by looking at the calculations of the tolerance and Variance Influenced Factor (VIF) values. Based on the test results, it is known that all independent variables that affect the supply, demand, and export of cocoa beans have a tolerance value above 0,10 and a VIF of less than 10, so it is stated that there is no multicollinearity.

The third stage is the heteroscedasticity test. This test uses the Glejser test to determine whether there is inequality in the residual variance in the equation model. Based on the test results, it is known that all independent variables in the supply, demand, and cocoa bean export equations have significance values greater than 0,05, so H0 is accepted and H1 is rejected. This shows that all independent variables in the three equations are free from heteroscedasticity.

The fourth stage is the autocorrelation test. This test uses the Brusch Godfrey method. In this test, the variables measured are lag variables or variables from the previous year. Based on the test results, it is known that the three lag variables in supply, demand, and exports have significance values above 0,05, so H0 is accepted and H1 is rejected. These results indicate that all lag variables in the three equation models are not autocorrelated.

Domestic Supply of Cocoa Beans

Domestic cocoa bean supply is simultaneously influenced by domestic cocoa bean price, domestic coffee bean price, productivity level, exports, and previous year's supply (t-1). This is evidenced by the result of the probability value in the F statistic of 0,000 ≤ 0,05. This figure explains that the five variables together (simultaneously) has a significant effect on domestic cocoa bean supply.

The result of testing the coefficient of determination (R2) obtained a value of 0,909 which explains that domestic cocoa bean supply is 90,9% influenced by domestic cocoa bean prices, domestic coffee bean prices, productivity levels, cocoa bean exports, and cocoa bean supply in the previous year (t-1). While the remaining 9,1% is influenced by other variables that are not in the equation model.

Based on the test results in Table 6, the domestic cocoa bean supply equation model is as follows:

$$LnQSBK = 12{,}138 + 0{,}290LnHBKD + 0{,}027LnHBOD + 0{,}676LnTP + 0{,}066LnXBK - 0{,}147LnQSBK_{t-1} + U_1$$

The domestic cocoa bean price (HBKD) shows a positive result of 0,290, which means that if the price of cocoa beans increases by 1%, the supply of cocoa beans will also increase by 0,290%. This is the same as the law of supply, which is that when the price increases, the amount of goods offered will also increase. The results of this study are not the same as the research of Anwar & Mulyawati (2023) which states that when the price of chili rises, the amount of chili sold does not increase. This is due to the slow response

of farmers to changes in chili prices. The t-statistic probability value of cocoa bean price is 0,003 ≤ 0,05 which indicates that cocoa bean price has a significant effect on domestic cocoa bean supply. The results are in line with Nurhudayah et al (2018) research on corn commodities where price has a significant effect on corn supply in South Sulawesi. However, this study is different from the research of Arofah & Setiawan (2022) which states that price has a significant effect on com supply in South Sulawesi.The value of the elasticity of cocoa bean price to supply shows 0,00754 in the short term, while in the long term it is 0,00657, so that the response of price changes is inelastic to domestic cocoa bean supply both in the short and long term. This explains that when cocoa bean prices increase by 1%, domestic cocoa bean supply increases by 0,00754% in the short term and 0.00657% in the long term.

The domestic price of coffee beans (HBOD) shows a positive result of 0,027, which means that if the price of coffee beans increases by 1%, the amount of cocoa beans offered will increase by 0,027%. This result contradicts the supply theory, where when the price of substitute goods rises, the supply of the main good decreases. This is because when the price of coffee beans rises, it does not immediately make farmers or producers replace cocoa beans by offering coffee beans to consumers. When coffee beans rise, farmers will continue to sell cocoa beans because they cannot easily to change land use. Commodity switching is not easy to do because it requires large capital and has a high risk of crop failure. In addition, although both commodities have the same function as the main raw material for making food and beverages, cocoa and coffee have different living conditions. Cocoa is a plant that can grow in the lowlands with an altitude of 0 - 600 masl (Junais & Sartika, 2022), while coffee can grow in the highlands where for robusta coffee at an altitude of 700 masl and arabica coffee above 1000 masl (Murdaningsih & Hutubessy, 2021). The t-statistic probability value of coffee bean price is 0,735 > 0,05, indicating that coffee bean price does not significantly affect domestic cocoa bean supply. This finding indicates that the high and low price of coffee beans does not influence farmers to switch from producing cocoa beans. This study is in line with research by Suciningtyas & Setiawan (2023) which explains that the price of cloves as a substitute product has no significant effect on the amount of coffee offered by farmers. The relationship between cocoa beans and coffee beans in this study shows the condition of farmers during the harvest period, thus showing an insignificant relationship because substitute commodities do not have a significant influence on supply (Sipayung & Ginting, 2019). The elasticity of coffee bean price with respect to domestic cocoa bean supply shows 0,00062 in the short term and 0,000054 in the long term, so that the re-

Table 6.
2SLS Test Results and Domestic Cocoa Beans Supply Elasticity

Variables	Understandardized Coefficients		Sig.	Elasticity	
	B	Std. Error		ESR	ELR
Constant	12,138	1,443	0,000		
HBKD	0,290	0,074	0,003	0,00754	0,00657
HBOD	0,027	0,076	0,735	0,00062	0,00054
TP	0,676	0,073	0,000	4,27434	3,72653
XBK	0,066	0,014	0,001	0,01669	0,01455
$QSBK_{t-1}$	-0,147	0,106	0,194	-0,14714	-0,12828

Source: Data Processed, 2024

sponse of changes in coffee bean prices is inelastic to domestic cocoa bean supply in both the short and long term. This explains that when the price of coffee beans increases by 1%, domestic cocoa bean supply will decrease by 0,00062% in the short term and 0,000054% in the long term.

The productivity (TP) level shows a positive result of 0,676, which means that if the productivity level increases by 1%, the supply will increase by 0,676%. This is in accordance with the theory of supply if productivity rises then the amount of cocoa beans produced on the land will also rise, thus making the supply of the amount of cocoa beans in the country will be greater. The probability value of the t-statistic of the productivity level is 0,000 ≤ 0,05, which indicates that the level of cocoa bean supply in the country will increase productivity has a significant effect on domestic cocoa bean supply. This result is in line with Isnirobit (2022) research regarding a case study on red chili which states that agricultural land productivity has a significant effect on red chili production in Indonesia. The elasticity value of productivity level to supply shows a figure of 4,27434 in the short term, while in the long term it is 3,72653. When the productivity level increases by 1%, it will make domestic cocoa bean supply increase by 4,27434% in the short term and by 3,72653% in the long term.

Cocoa bean exports (XBK) show a positive result of 0,066 which means that if cocoa bean exports increase by 1%, supply will also increase by 0,066%. The t-statistic probability value of cocoa bean price is 0,001 ≤ 0,05 which indicates that cocoa bean exports have a significant effect on domestic cocoa bean supply. The results of this study explain that the rise and fall of exports will have a real impact on domestic cocoa bean supply. This is because an increase in cocoa bean exports can be caused by a high increase in demand for cocoa beans in the international market, which makes farmers tend to increase production to meet demand. This increased production will also have an impact on the increase in the amount of cocoa beans offered by farmers to the domestic processing industry. The cocoa bean export elasticity of supply is 0,01669 in the short term and in the long run long term is 0,01455. This figure means that the response of export changes is inelastic to domestic cocoa bean supply in both the short and long term. This explains that when cocoa bean exports increase by 1%, domestic supply also increases by 0,01669% in the short term, while in the long term by 0.01455%.

Domestic cocoa bean supply in the previous year (QSBKt-1) shows a negative result of -0,147 which means that when cocoa bean supply in the previous year increases by 1%, domestic cocoa bean supply will decrease by 0,147%. This can be seen from the cocoa bean supply in year t which is often lower than in the previous year. The decline in cocoa bean supply is due to fluctuating cocoa bean production. The decline in cocoa bean production is caused by the low ability of farmers to manage the land, soil fatigue, low fertilizer use, and pest attacks which have an impact on the decline in the number of cocoa beans offered. This statement is supported by Gusvita's (2017) research on the case study of t-1 rice supply which is negative to the t-year supply due to various constraints such as pests and diseases faced by farmers in producing rice. The t-statistic value of total supply t-1 is 0,194 > 0,05 which means that cocoa bean supply t-1 does not significantly affect domestic cocoa bean supply. However, the results of this study are not the same as those conducted by Aprilliani et al (2020) on cayenne pepper commodities where the t-1 supply has a real influence on the t-year supply. The previous year's cocoa bean supply elasticity value in the short term shows -0,14714 and -0.12828 in the long term, so that the response of changes in previous year's cocoa bean supply is inelastic to domes-

tic cocoa bean demand both in the short and long term. A negative elasticity means that the previous year's cocoa bean supply has an inverse relationship with domestic cocoa bean supply. This means that if the previous year's supply increases by 1% then in the short term domestic cocoa bean supply will decrease by 0,14714%, while in the long term it will decrease by 0,12828%.

Domestic Demand of Cocoa Beans

Domestic cocoa bean demand is simultaneously influenced by domestic cocoa bean prices, domestic coffee bean prices, cocoa bean exports, and cocoa bean demand in the previous year (t-1). This is evidenced by the F statistic result of 0,000 ≤ 0,05. This figure explains that the four variables together (simultaneously) have a significant influence on domestic cocoa bean demand.

The result of testing the coefficient of determination (R2) obtained a value of 0,970 which explains that domestic demand for cocoa beans is 97% influenced by domestic cocoa bean prices, domestic coffee bean prices, cocoa bean exports, and cocoa bean demand in the previous year (t-1). While the remaining 3% is influenced by other variables that are not in the equation model.

Based on the test results in Table 7, the domestic cocoa bean demand equation moel is as follows:

$$LnQDBK = 7,132 + 0,251LnHBKD + 0,243LnHBOD - 0,073LnXBK + 0,156LnQDBK_{t-1} + U_2$$

The domestic cocoa bean price (HBKD) shows a positive result of 0,0251 which means that when the price of cocoa beans increases by 1%, the demand for cocoa beans will increase by 0.251%. This contradicts the law of demand, where when prices increases demand will decrease. This is consistent with research by Wibowo & Surbakti (2023) which states that the domestic price of onions has a negative effect so that when prices rise consumers reduce the amount of onions purchased. The demand for cocoa beans that continues to rise despite the price increase is due to the government's cocoa bean down stream program to be processed into value added products such as cocoa butter and powder (Ramadhani et al., 2023). This is why the demand for cocoa beans does not fall despite the price increase. The t-statistic probability value of cocoa bean price is 0,038 ≤ 0,05 which indicates that cocoa bean price has a significant effect on domestic demand for cocoa beans. The results of this study are in accordance with research by Satria et al (2021) which explains that the real price of cocoa beans has a significant effect on domestic demand for the cocoa processing industry. The price elasticity of cocoa beans with respect to demand shows 0,00878 in the short term and 0,01040 in the long term, so that the response of price changes is inelastic to domestic cocoa bean demand in both the short and long term. This finding means that when

Table 7.
2SLS Test Results and Domestic Cocoa Bean Demand Elasticity

Variables	Understandardized Coefficients		Sig.	Elasticity	
	B	Std. Error		ESR	ELR
Constant	7,132	1,288	0,000		
HBKD	0,251	0,106	0,038	0,00878	0,01040
HBOD	0,243	0,124	0,076	0,00753	0,00892
XBK	-0,073	0,023	0,008	-0,02467	-0,02922
$QDBK_{t-1}$	0,156	0,104	0,160	0,14788	0,17521

Source: Data Processed, 2024

the price of cocoa beans increases by 1%, domestic demand for cocoa beans in the short term will decrease by 0,00878% and in the long term will decrease by 0,01040%.

The price of domestic coffee beans (HBOD) shows a positive result of 0,243 which means that when the price of coffee beans increases by 1%, it will increase the demand for domestic cocoa beans by 0.243%. This result is consistent with demand theory if the price of substitute products rises, it will increase the amount of demand for the main product. The t-statistic probability value of coffee bean price is 0,076 > 0,05, which shows that the price of coffee beans does not significantly affect the domestic demand for cocoa beans. This is because coffee beans cannot necessarily replace cocoa beans as the main raw material in the cocoa processing industry. The results of this study are in line with the research of Setianingsih et al (2021) which states that corn as a substitute for rice has a positive but insignificant effect on the demand for rice. Rice and com are food commodities, but although both are included in staple foods, people cannot easily replace rice with maize and switch to consuming maize as their daily food. The value of price elasticity of coffee beans to demand shows 0,00753 in the short term and 0,00892 in the long term, which means that the value is more than zero, thus in accordance with the theory of cross price elasticity which states that coffee beans are proven to be a substitute good for cocoa beans. The response of coffee bean price changes is inelastic to domestic cocoa bean demand in the short and long term. The findings explain that when the price of coffee beans increases by 1%, domestic demand will increase by 0,00753% in the short term, while in the long term it will increase by 0,00892%.

Indonesian cocoa bean exports (XBK) show a negative result of -0.073 which means that a 1% increase in cocoa bean exports makes domestic cocoa bean demand decrease by 0,073%. The t-statistic probability value of cocoa bean exports is 0,008 ≤ 0,05 which indicates that exports have a significant effect on domestic cocoa bean demand. The findings explain that when exports increase, the domestic supply decreases. The depletion of cocoa beans has an impact on scarcity which can make prices rise and demand for cocoa beans fall. The elasticity value of cocoa bean. exports shows -0,02467 in the short term, while in the long term it is -0,02922, so that the response of export changes is inelastic to domestic demand in both the short and long term. A negative elasticity means that the export variable has an inverse correlation with domestic demand for cocoa beans. This means that if cocoa bean exports increase by 1% then domestic demand decreases by 0,02467% in the short term and also decreases by 0,02922% in the long term.

Demand for cocoa beans in the previous year ($QDBK_{t-1}$) shows a positive result of 0,156, which means that when demand for cocoa beans in the previous year increases by 1%, domestic demand increases by 0,156%. This result can be seen from the demand for cocoa beans which tends to increase every year due to the government focusing on processing cocoa beans into new products. The t-statistic probability value of cocoa bean demand in the previous year is 0,160 > 0,05 which indicates that cocoa bean demand in year *t-1* does not have a significant effect on domestic cocoa bean demand. Changes in *t-1* cocoa bean demand do not have a large impact on domestic cocoa bean demand due to the policy on the down streaming of cocoa beans, so the amount of cocoa beans used previously does affect the amount of cocoa beans used in not the present. The results of this study are not in line with Septiadi & Joka (2019) research on rice, which states that demand in year t-1 has a real influence on demand in year t-1. The previous year's cocoa bear

demand elasticity value shows 0,14788 in the short term, while in the long term it is 0,17521. This figure explains that the response of changes in the previous year's cocoa bean supply is inelastic to domestic cocoa bean demand in the short and long term. This result means that when demand t-1 increases by 1%, domestic cocoa bean demand will increase by 0,14788% in the short term, while in the long term it will also increase by 0,17521%.

Indonesia's Cocoa Bean Export

Indonesian cocoa bean exports are simultaneously influenced by international prices, exchange rates, domestic supply of cocoa beans, and domestic demand for cocoa beans. This is evidenced by the result on the F statistic of 0,000 ≤ 0,05. This figure explains that the four variables together (simultaneously) have a significant influence on Indonesian cocoa bean exports.

The result of testing the coefficient of determination (R2) obtained a value of 0,970 which explains that Indonesian cocoa bean exports are 97% influenced by international prices, exchange rates, total domestic supply, and total domestic demand. While the remaining 3% is influenced by other variables that are not in the equation model.

Based on the test results in Table 8, the domestic cocoa bean export equation model is as follows:

$$LnXBK = 23,929 + 0,549LnHBKI - 3,149LnNT + 2,742LnQSBK - 1,845LnQDBK + U_3$$

The international cocoa bean price (HBKI) shows a positive result of 0,549 which means that when the international cocoa bean price increases by 1%, cocoa bean exports will increase by 0,549%. This is consistent with the supply theory. which explains that when international prices rise, farmers will tend to sell their crops in the international market in order to obtain greater profits (Pinem et al., 2022). The t-statistic probability value of international cocoa bean prices is 0,113 > 0,05 which shows that international prices do not have a significant influence on Indonesian cocoa bean exports. The findings are in line with research by Wibowo (2017) which states that international cocoa prices have a positive direction and have no significant effect on the amount of cocoa exports. This is because there are regulations regarding the price cut system by importing countries due to the low quality of Indonesian cocoa beans, so that the rise and fall of international cocoa bean prices do not have a direct impact on the volume of cocoa bean exports (Putro & Winandi, 2023). In the international market, Indonesian cocoa is given a low price due to the large number of dirty beans, the presence of insects, mold, and poorly fermented (Nurhadi et al., 2019).

The exchange rate of the rupiah to the dollar (NT) shows a negative result of -3.149 which means that when the exchange rate increases (appreciation) by 1%, cocoa bean exports will decrease by 3,149%. This is similar to the export theory that when the exchange rate of the rupiah

Table 8.
2SLS Test Results of Indonesian Cocoa Bean Exports

Variables	Understandardized Coefficients		Sig.
	B	Std. Error	
Constant	23,929	10,685	0,047
HBKI	0,549	0,319	0,113
NT	-3,149	0,503	0,000
QSBK	2,742	0,644	0,001
QDBK	-1,845	0,341	0,000

Source: Data Processed, 2024

to dollar increases, cocoa bean exports will decrease. This is because when the exchange rate appreciates, the price of cocoa beans in the currency of the importing country will increase, resulting in a decrease in demand and consequently a decrease in cocoa bean exports. The t-statistic value of the exchange rate shows 0,000 ≤ 0,05, which means that the exchange rate has a significant effect on Indonesian cocoa bean exports. The exchange rate has a significant effect on exports because the price of cocoa beans offered is influenced by the exchange rate. When the rupiah exchange rate depreciates, it causes exports to increase because commodity prices are considered cheap by importing countries (Hasibuan et al., 2023). Therefore, when the exchange rate weakens, importing countries will buy more cocoa beans from Indonesia. The results of this test are similar to the research of Aziziah & Setiawina (2021) which explains that the exchange rate has a negative and significant effect on Indonesian cocoa exports to the Netherlands in 1990 2019. The results of this study are also supported by Hadi & Setyo (2019) the research of which states that the exchange rate has a negative relationship and has a significant effect on Indonesia's cocoa bean exports in 1996-2015.

The domestic supply of cocoa beans (QSBK) shows a positive result of 2,742 which means that when the supply of cocoa beans increases by 1%, exports will increase by 2,247%. These results are in accordance with the law of supply when the amount of production increases, exports will also increase, In this study, the amount of supply is identical to the amount of cocoa bean production produced by farmers. The result of testing the t-statistic probability of total supply is 0,001 ≤ 0,05, which means that the domestic supply of cocoa beans has a significant influence on Indonesian cocoa bean exports. This finding is in line with the research of Al Ghozy et al (2017) which states that the amount of cocoa production has a positive and significant relationship with cocoa exports, so in other words the domestic supply of cocoa beans has a positive and significant effect on cocoa exports in Indonesia. Fauzi & Islami, 2023) also explained in their research that in the long run, the supply of cocoa beans in Indonesia has a positive and significant influence on the amount exported to the United States. This is because the large amount of cocoa that Indonesia produces allows the country to export large quantities to destinations including the United States. However, this result is not in line with research on tobacco commodities by Nainggolan & Sihotang (2021) which states that the amount of production has a negative and unreal effect on the volume of tobacco exports.

Total domestic demand for cocoa beans (QDBK) shows a negative result of -1,845 which means that when total demand for cocoa beans increases by 1%, exports will decrease by 1,845%. This is in accordance with the demand theory where when the amount of domestic demand increases, exports will decrease. The t-statistic value of total demand is 0,000 ≤ 0,05, which shows that domestic demand for cocoa beans has a significant effect on Indonesian cocoa bean exports. These findings are in line with the research of Anggraeni et al (2020) which explains that domestic vanilla consumption has a negative and significant relationship with Indonesian vanilla exports. Domestic consumption will affect the size of domestic vanilla demand.This finding is in line with the current condition of Indonesia, which is focusing on utilizing cocoa beans for the domestic industry by downstreaming cocoa beans. This downstreaming makes cocoa beans more used for domestic processing than for export to other countries. This has caused the domestic demand for cocoa beans to increase each year, while Indonesia's cocoa bean exports have decreased.

CONCLUSIONS

The variables of domestic cocoa bean price, productivity level, and cocoa bean exports have a positive and significant relationship with domestic cocoa bean supply. The domestic cocoa bean price variable has a positive and insignificant effect on domestic supply. Meanwhile, the previous year (t-1) supply variable has a negative and insignificant effect on domestic cocoa bean supply.

The domestic cocoa bean price variable has a positive and significant effect on domestic demand. The cocoa bean export variable has a negative and significant effect on domestic demand. Meanwhile, the variables of domestic coffee bean price and demand in the previous year (t-1) have a positive and insignificant relationship with domestic cocoa bean demand.

The international price variable has a positive and insignificant effect on Indonesian cocoa bean exports. The variables of exchange rate and domestic demand have a negative and significant effect on Indonesian cocoa bean exports. Meanwhile, the domestic supply variable has a positive and significant relationship with Indonesian cocoa bean exports.

In this study, the price variable is the only variable that affects the supply, demand and export of cocoa beans simultaneously. The low quality of Indonesian cocoa beans results in low cocoa bean prices. This is because cocoa beans do not go through a proper fermentation process. The government has provided technology and fermentation tools, but they have not been applied optimally by farmers because they do not fully understand the tools and technology. Therefore, regular education to farmers is needed as well as direct supervision in using the tools and technology that have been provided. In addition, the government can create a fermentation center to handle the fermentation process, quality control, and marketing of cocoa beans.

Government programs on cocoa bean down streaming also need to be maximized. The existence of this program has led to the emergence of many processing units on a small and medium scale. In contrast to large scale companies, this processing unit has not yet reached a wide market and still lacks information in the processing process. Therefore, in order to support this processing unit, the government can assist in providing training on how to properly process cocoa beans and help direct the results to both local and international markets.

REFERENCE

Al Ghozy, M. R., Soelistiyo, A., & Kusuma, H. (2017). Analisis Ekspor Kakao Indonesia di Pasar Internasional. *Jurnal Ilmu Ekonomi*, 1. https://doi.org/https://doi.org/10.22219/jie.v1i4.6284

Ananda, R., Iskandar, S., & Afriyatna, S. (2018). Analisis Faktor-Faktor yang Mempengaruhi Volume Ekspor dan Produksi Kakao di Indonesia. *Societa: Jurnal Ilmu-Ilmu Agribisnis*, 6(2), 111. https://doi.org/10.32502/jsct.v6i2.826

Anggraeni, I., Nurhadi, E., & Widayanti, S. (2020). Ekspor Vanili dan Pengaruhnya terhadap Pertumbuhan Ekonomi Indonesia. *Agridevina: Berkala Ilmiah Agribisnis*, 8(2), 99–114. https://doi.org/10.33005/adv.v8i2.1802

Anwar, A., & Mulyawati, S. (2023). Faktor-Faktor yang Mempengaruhi Penawaran Cabai Rawit di Kecamatan Narmada Kabupaten Lombok Barat. *AGROTEKSOS*, 33(1), 291–302. https://doi.org/10.29303/agroteksos.v33i1.840

Aprilliani, M., Antriyandarti, E., & Rahayu, W. (2020). Analisis Penawaran Cabai Rawit (Capsicum frutscens L.) di Kabupaten Boyolali. *Media Trend*, 15(2), 217–226. https://doi.org/10.21107/mediatrend.v15i2.5333

Arofah, S. N., & Setiawan, A. H. (2022). Analisis Determinan Penawaran Tembakau (Studi Kasus: Fenomena Patron-Klien Antara Petani Tembakau Dan Tengkulak Di Desa Katekan, Kecamatan Ngadirejo, Temanggung). *BISECER (Business Economic Entrepreneurship)*, 5(1), 19. https://doi.org/10.61689/bisecer.v5i1.291

Aziziah, S. A., & Setiawina, N. D. (2021). Analisis Pengaruh Produksi, Harga Dan Nilai Tukar Terhadap Ekspor Biji Kakao Indonesia Ke Belanda. *Cerdika: Jurnal Ilmiah Indonesia*, 1(4), 448–455.

BPS. (2022). Statistik Kakao Indonesia 2021.

Fauzi, A., Sandopart, D. P. Y. A. L., Anglaini, E., Utami, P. K., Adha, M. A., & Dewanahalim, M. A. (2023). Pengaruh Permintaan dan Penawaran terhadap Kebutuhan Pokok di Pasar. *Jurnal Ekonomi Dan Manajemen*, 2(2), 29–39. https://doi.org/10.56127/jekma.v2i2.711

Fauzi, F. A., & Islami, F. S. (2023). Analisis Faktor-Faktor Yang Mempengaruhi Volume Ekspor Kakao Indonesia Ke Amerika Serikat. Jurnal Ilmiah Mahasiswa Fakultas Pertanian, 2(2), 195–203. https://doi.org/10.52045/jimfp.v2i2.348

Gusvita, H. (2017). Analisis Penawaran Beras di Kabupaten Pesisir Selatan. *UNES Journal Mahasiswa Pertanian*, 1(1), 43–53.

Hadi, A. F., & Setyo, W. A. (2019). Analysis of Factors Affecting the Value of Export of Indonesian Cocoa Beans in 1996-2015. *Ekuilibrium: Jurnal Ilmiah Bidang Ilmu Ekonomi*, 14(1), 16–30. https://doi.org/10.24269/ekuilibrium.v14i1.2019.pp16-30

Hasibuan, S. N., Siregar, A., & Ahmad Rafiki. (2023). Analisis Faktor-Faktor yang Mempengaruhi Ekspor Sayur Kubis di Provinsi Sumatera Utara. *JURNAL AGRICA*, 16(2), 152–163. https://doi.org/10.31289/agrica.v16i2.6720

Isnirobit. (2022). Analisis Pengaruh Luas Panen, Harga Jual, dan Produktivitas terhadap Jumlah Produksi Cabai Merah (Capsicum annuum L) di Indonesia Tahun 1999-2015. *Agriland: Jurnal Ilmu Pertanian*, 10(3), 278–290. https://doi.org/10.30743/agr.v10i3.6648

Junais, I., & Sartika, D. (2022). Analisis Mutu Fisik Dan Kimia Biji Kakao Berdasarkan Pola Ketinggian Lokasi Tanam di Kecamatan Bua Kabupaten Luwu. *Jurnal Agritechno*, 57–66. https://doi.org/10.20956/at.v15i1.691

Manalu, R. (2019). Pengelolaan Mutu Biji Kakao Petani Perkebunan Rakyat Melalui Teknologi Fermentasi untuk Memperoleh Nilai Ekonomi yang Lebih Baik. *Jurnal Ekonomi Dan Kebijakan Publik*, 9(2), 99–112. https://doi.org/10.22212/jekp.v9i2.1006

Mawardi, A. N., Suswatiningsih, T. E., & Ambarsari, A. (2021). Analisis Faktor-Faktor yang Mempengaruhi Ekspor Karet Alam Indonesia ke Brazil. *AGRIFITIA: Journal of Agribusiness Plantation*, 1(1).

Murdaningsih, & Hutubessy, J. I. B. (2021). Pengelolaan Agroekosistem Tanaman Kopi di Desa Wologai Tengah-Kecamatan Detusoko Kabupaten Ende Coffee Plant Agroecosystem Management In Wologai Tengah Village-Detusoko District-Ende Regency. *Panrita Abdi-Jurnal Pengabdian Pada Masyarakat*, 5(4), 690–697. https://doi.org/https://doi.org/10.20956/pa.v5i4.10537

Nainggolan, Z., & Sihotang, J. (2021). Analisis Pengaruh Jumlah produksi, Nilai Tukar dan Harga Internasional terhadap Ekspor Tembakau Indonesia Tahun 1990–2019. *Journal of Economic and Business*, 2(2), 18–28. https://

doi.org/https://doi.org/10.36655/jeb.v2i2.551

Nurhadi, E., Hidayat, S. I., Indah, P. N., Widayanti, S., & Harya, G. I. (2019). Keberlanjutan Komoditas Kakao sebagai Produk Unggulan Agroindustri dalam Meningkatkan Kesejahteraan Petani. *Agriekonomika*, 8(1), 51–61. https://doi.org/10.21107/agriekonomika.v8i1.5017

Nurhudayah, N., Arifin, A., & Sadat, M. A. (2018). Faktor-Faktor yang Mempengaruhi Penawaran Jagung di Sulawesi Selatan. *Jurnal Agribisnis*, 6(2), 36–48.

Nurun Nisa', D. P. J. I., Darsono, D., & Antriyandarti, E. (2023). Daya Saing Biji Kakao di Pasar Malaysia. *Jurnal Kawistara*, 13(2), 222. https://doi.org/10.22146/kawistara.77200

Oktarini, O. (2021). Respon Pertumbuhan Bibit Kakao (Theobroma Cacao L.) Dengan Aplikasi Pupuk Organik Dan Pupuk Urea. Politeknik Negeri Jember.

Pinem, E. R., Supriana, T., & Ayu, S. F. (2022). Analisis Faktor-Faktor yang Mempengaruhi Ekspor Kubis dari Provinsi Sumatera Utara, Indonesia ke Malaysia. *Agro Bali : Agricultural Journal*, 5(3), 552–558. https://doi.org/10.37637/ab.v5i3.995

Putri, R., & Prihtanti, T. (2020). Faktor-Faktor yang Mempengaruhi Volume Ekspor Kakao Indonesia Tahun 2007-2017. *Jurnal Ekonomi Pertanian Dan Agribisnis*, 4(3), 528–536. https://doi.org/10.21776/ub.jepa.2020.004.03.08

Putro, S. A. C., & Winandi, R. (2023). Factors Affecting Export of Indonesian Cocoa Beans To Malaysia. *Jurnal Manajemen & Agribisnis*, 20(1), 90. https://doi.org/10.17358/jma.20.1.90

Rahmatul Putri, I., Priana, W., & Wahed, M. (2021). Analisis Faktor-Faktor yang Mempengaruhi Ekspor Teh Indonesia Ke Malaysia. *Jurnal Syntax Admiration*, 2(6), 1066–1082. https://doi.org/10.46799/jsa.v2i6.242

Ramadhani, R. A., Rifin, A., & Novianti, T. (2023). Analisis Daya Saing dan Kebijakan Bea Keluar pada Komoditas Kakao (Theobroma cacao) Indonesia. *Analisis Kebijakan Pertanian*, 21(2), 171–186. https://doi.org/10.21082/akp.v21i2.171-186

Rambe, K. R., & Kusnadi, N. (2018). Permintaan dan Penawaran Minyak Goreng Sawit Indonesia. *Forum Agribisnis*, 8(1), 61–80. https://doi.org/10.29244/fagb.8.1.61-80

Rianda, C. N. (2020). Pengaruh Ekspor Impor terhadap Cadangan Devisa di Indonesia. *AT-TASYRI': Jurnal Ilmiah Prodi Muamalah*, 12(2), 165–173. https://doi.org/10.47498/tasyri.v12i2.384

Satria, F. M., Nugraha, A., Yudha, E. P., & Ernah, E. (2021). Faktor-Faktor Yang Mempengaruhi Permintaan Industri Hilir Domestik Terhadap Biji Kakao. *Agricore: Jurnal Agribisnis Dan Sosial Ekonomi Pertanian Unpad*, 5(2). https://doi.org/10.24198/agricore.v5i2.30800

Septiadi, D., & Joka, U. (2019). Analisis Respon dan Faktor-Faktor yang Mempengaruhi Permintaan Beras Indonesia. *AGRIMOR*, 4(3), 42–44. https://doi.org/10.32938/ag.v4i3.843

Setianingsih, A., Halid, A., & Imran, S. (2021). Faktor-Faktor yang Mempengaruhi Permintaan Beras di Kota Gorontalo. *AGRINESIA: Jurnal Ilmiah Agribisnis*, 5(2), 101–109. https://doi.org/10.37046/agr.v5i2.11945

Shina, A. F. I. (2018). Estimasi Parameter pada Sistem Model Persamaan Simultan Data Panel Dinamis dengan Metode 2SLS GMM-AB. *MEDIA STATISTIKA*, 11(2), 79–91. https://doi.org/10.14710/medstat.11.2.79-91

Sipayung, B. P., & Ginting, R. (2019).

Analisis Faktor Penawaran Kentang di Provinsi Sumatera Utara (Periode 2003-2012). *Agrimor*, 4(1), 7–8. https://doi.org/10.32938/ag.v4i1.692

Suciningtyas, A. D., & Setiawan, A. H. (2023). Analisis Faktor-Faktor yang Mempengaruhi Penawaran Kopi Robusta di Kecamatan Kandangan Kabupaten Temanggung. *BISECER (Business Economic Entrepreneurship)*, 6(1), 1. https://doi.org/10.61689/bisecer.v6i1.391

Venny, S., & Asriati, N. (2022). Permintaan dan Penawaran dalam Ekonomi Mikro. *Jurnal Pendidikan Ekonomi (JURKAMI)*, 7(1), 184–194. https://doi.org/10.31932/jpe.v7i1.1583

Wibowo, M. A. (2017). Faktor Faktor yang Mempengaruhi Volume Ekspor Kakao Indonesia Periode 2006-2015. *Ekonomi Dan Bisnis: Berkala Publikasi Gagasan Konseptual, Hasil Penelitian, Kajian, Dan Terapan Teori*, 22(1), 1–8. https://doi.org/10.24123/jeb.v22i1.1641

Wibowo, R. P., & Surbakti, N. J. R. (2023). Faktor-Faktor yang Mempengaruhi Permintaan dan Penawaran Bawang Merah di Indonesia. *Agro Bali : Agricultural Journal*, 6(2), 326–336. https://doi.org/10.37637/ab.v6i2.1312