JOBDIGI: Jurnal Ekonomi Digital dan Global Bisnis
Vol.1, No.1, March 2025
https://journal.atdbi.or.id/index.php/jodigbi/

THE EFFECT OF FOOD INFLATION, PER CAPITA INCOME AND CONSUMER SPENDING ON ASEAN FOOD SECURITY IN 2013-2022

Ayuningtyas[1], Siti Nurjanah[2], Rd. Tuty Sariwulan[3]
[1-3] Universitas Negeri Jakarta, Indonesia
E-mail: 1) Ayuningtyas0826@gmail.com, 2) snurjanah@unj.ac.id, 3) tuty.wulan@unj.ac.id

Article Info

Article history:
Received: 25 March 2025;
Accepted: 26 March 2025;
Published: 28 March 2025.

Keyword:
Food Inflation, Per Capita Income, Consumer Spending, ASEAN Country Food Security

Abstract

This study aims to analyze the influence of food inflation, per capita income, and consumer spending on food security in four ASEAN countries, namely Indonesia, Malaysia, Singapore, and Thailand, during the period 2013 to 2022. Using a quantitative approach with panel regression analysis, this study processed secondary data from various official sources, such as FAO, World Bank, and the Economist Intelligence Unit. The results of the study showed that independent variables, namely food inflation, per capita income and consumer spending, were able to explain the dependent variable, namely food security by 74%, while the remaining 25.3% was explained by other variables outside the model.This research provides important implications for policymakers in ASEAN countries in formulating strategies that can stabilize food prices, improve economic welfare, and optimize food distribution and accessibility to achieve more sustainable food security in the region.

1. INTRODUCTION

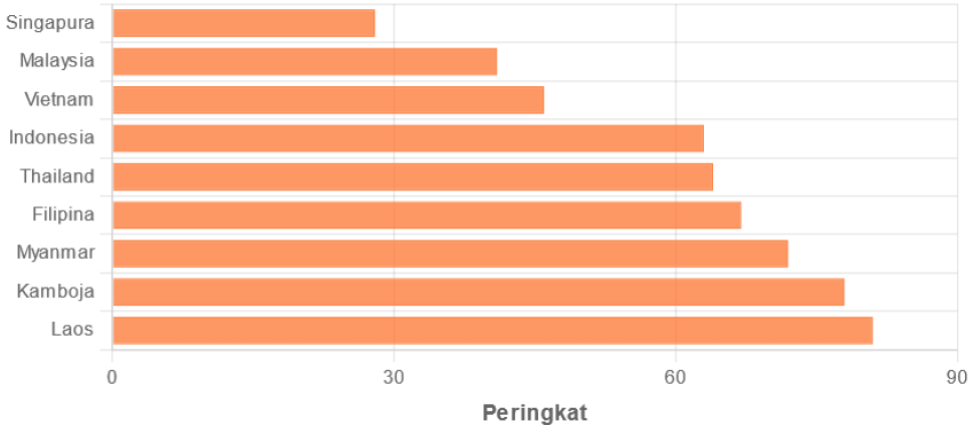
Food security has long been identified as a key issue in the ASEAN region, but each country has different specific challenges (FAO, 2021; Economist Intelligence Unit, 2022). Indonesia, for example, faces major problems in food distribution due to its large geographical area and dependence on imports for some food commodities. High food inflation in recent years has also complicated efforts to maintain food security, especially for low-income communities and in remote areas (Asian Development Bank, 2021; Toromade et al., 2024). Malaysia, which has a strong agricultural base, still has to face food inflation pressures due to global price fluctuations and climate change, so the government strengthens domestic supply chains to maintain stability (FAO, 2022). Thailand as an agricultural country and a major food exporter also experiences challenges of domestic food inflation and difficulties in maintaining a balance between export needs and domestic consumption (OECD, 2021). Meanwhile, Singapore, which is heavily dependent on food imports, is able to manage food security effectively through diversification of import sources, efficiency of trade policies, and investment in food technology such as urban farming (Ministry of Trade and Industry Singapore, 2020; World Economic Forum, 2022). These four countries represent a variety of problems and policies in dealing with food security issues, so they are relevant representations for analyzing the variety of strategies in the ASEAN region.

In addition, previous studies tend to focus on only one country or one specific aspect, such as food inflation, per capita income, or consumer spending separately (Muttaqin et al., 2024; Wahab Samad et al., 2022; Wongnaa et al., 2019; Ndiaye, 2022). These studies have not highlighted the interaction and simultaneous influence of these three macroeconomic variables on cross-border food security in the ASEAN region. Therefore, this study was built on the basis of a gap in the literature regarding the relationship between food inflation, per capita income, and consumer spending simultaneously in influencing food security. Using a panel data approach on four selected countries, this study aims to provide a more comprehensive and relevant analysis to support the formulation of integrated food security policies at the regional level.

To support this analysis, this study operationally defines the key terms used. Food security refers to the condition when all people have adequate physical, social, and economic access to safe and nutritious food, with indicators

referring to the Global Food Security Index (GFSI) (FAO, 1996; Law of the Republic of Indonesia No. 7 of 1996; Economist Intelligence Unit, 2022). Food inflation is measured based on changes in the consumer price index for food components (food CPI) in each country (BPS, 2024; World Bank, 2022). Per capita income is defined as the average income of the population per year, which is obtained from GDP data divided by the number of people (Wang et al., 2021; World Bank, 2022), while consumer spending is measured by total household expenditure on consumption, both food and non-food (Kotler, 2020; Yulita, 2024). With a clear definition and measurement of variables, this research is expected to make a useful empirical and policy contribution in strengthening food security in the ASEAN region.

Figure 1. Data on Food Security in Asean Countries
Source : Economist Intelligence Unit (EIU)



This study aims to simultaneously analyze the influence of food inflation, per capita income, and consumer spending on food security in Indonesia, Malaysia, Singapore, and Thailand for the 2013-2022 period. By understanding the interaction of these three variables, it is hoped that it can provide comprehensive policy recommendations to strengthen food security in the ASEAN region..

2. LITERATURE REVIEW

2.1. Theoretical Studies

Food security has been conceptually defined in various literature as a system that ensures that all people have access to sufficient, nutritious, and safe food. According to Wahyuni (2020), this system consists of a subsystem of availability, distribution, and consumption, which emphasizes the importance of a fair distribution mechanism so that food access is not only centralized in certain areas. The perspective of FAO (1996) adds the dimension of food stability and quality, highlighting the importance of sustainability and food security aspects, so that food security is not only a matter of quantitative availability, but also continuity and quality. In the context of ASEAN, this is increasingly important given the disparity between countries in terms of infrastructure and distribution capabilities, as reflected in the difference in Global Food Security Index (GFSI) scores between Singapore and Indonesia.

Food inflation, in some theories, is seen not only as a macroeconomic symptom—an increase in food prices due to demand and supply pressures (Novia, 2024)—but also as a reflection of the vulnerability of the national food system to external disturbances such as climate change and global price volatility (Muttaqin et al., 2024). While most studies agree that food inflation reduces purchasing power and limits access to food for vulnerable groups, some studies highlight that countries with price control policies and strategic food reserves (e.g. Singapore) can mitigate the impact of inflation better than countries with weak distribution systems (Indonesia, Thailand). This suggests that policy responses can be a key differentiator in food security resilience to inflationary pressures.

Per capita income, as an indicator of people's purchasing power, is widely used in economic studies to explain the ability to access nutritious food. However, there is debate regarding its effectiveness as the only indicator. Classical theories assert that increased income automatically increases food security (Drewnowski & Darmon, 2005), while contemporary studies such as Portia et al. (2019) and Adewale & Belewu (2022) warn that unequal income distribution can make the benefits of increased income unevenly felt. In countries with high economic inequality, access to food remains problematic even as average per capita income rises. Therefore, the analysis of food security increasingly emphasizes the need for policy interventions that not only pursue income growth, but also equitable distribution and inclusive access.

Consumer spending on food has also come under the spotlight from various theories of consumer behavior and economics. According to Kotler (2020), consumer spending is influenced by income, prices, trust in economic conditions, as well as psychological factors such as preferences and nutrition education. There are differing views on the extent to which consumer spending is able to improve food security. Some of the literature emphasizes that high

spending does not necessarily have a positive impact if it is not directed towards nutritious and diverse foods (Roessali et al., 2019). On the other hand, food price policies and public education greatly determine the effectiveness of consumer spending in building food security, especially in countries with consumption patterns that are still focused on cheap staple foods, not high-quality food.

Thus, this literature review not only displays empirical definitions and findings, but also highlights the growing variety of viewpoints and theories. Critical analysis of the theories and research results is important in designing adaptive conceptual models and food security policies, especially for the ASEAN region which is highly heterogeneous in terms of economic, social, and food systems.

2.2. Previous Research

A number of previous studies have discussed the influence of food inflation, per capita income, and consumer spending on food security, both at the local and regional levels, such as:

1. Muttaqin et al. (2024), for example, utilize the Early Warning System (EWS) based on the Simple Additive Weighting (SAW) method to maintain food price stability in Sukabumi, focusing on monitoring the prices of strategic food commodities to assist local government decision-making. Their findings underscore the importance of technology-based policy innovations to respond to price fluctuations, although the study is still limited to a regional scale and does not yet cover dynamics at the broader country or regional level.
2. The research of Wahab Samad et al. (2022) highlights the impact of investment in the food sector through strengthening infrastructure and supply chains, which have been proven to increase production and help stabilize food inflation at the regional level. However, this approach focuses more on microeconomic aspects and investment feasibility, without exploring the simultaneous linkages between food inflation, public incomes, and consumer spending comprehensively.
3. Meanwhile, the study by Fuadi & Sukandi (2024) used the Balanced Scorecard method to assess the efficiency of rice production in Tasikmalaya, as well as its relationship with increasing community income and food security. While it offers the idea that improving production efficiency can have a positive impact on income and food security, this study tends to focus on a single commodity and region, and has not tested the cross-border influence.
4. The research by Oktyajati et al. (2021) with a system dynamics approach emphasizes the importance of increasing soybean production and farmers' income as a strategy to strengthen food security. This study provides a perspective on the interaction between variables in the agricultural supply chain, but the object analyzed is still limited to specific commodities and regions.
5. Research by Portia et al. (2019) and Adewale & Belewu (2022) found that small-scale agricultural entrepreneurship contributes significantly to increased household income, which ultimately strengthens food security especially in rural areas. These findings underscore the importance of diversifying sources of income in efforts to strengthen food security, but have not yet integrated macroeconomic variables simultaneously such as food inflation and consumer spending patterns.

Although a variety of approaches and methodologies have been used in previous research—from early warning systems, investment analysis, to dynamic models of supply chains—most studies have only reviewed one or two aspects of the overall variables that affect food security. Limited geographical coverage (often only at the local/regional level), objects of analysis (certain commodities), and lack of integration between macroeconomic and micro economic variables are gaps that still need to be bridged.

Therefore, this study positions itself as a new contribution by simultaneously examining the influence of food inflation, per capita income, and consumer spending on food security in four ASEAN countries in a panel and comparative manner during the period 2013–2022. With this approach, it is hoped that a more comprehensive picture of the interaction between variables can be obtained, as well as produce policy recommendations that are more integrative and applicable to the ASEAN region.

2.3. Theoretical Framework

The theoretical framework of this study highlights the interaction between food inflation, per capita income, and consumer spending in influencing food security in ASEAN countries. Food inflation, which is a continuous increase in food commodity prices, directly reduces people's purchasing power, especially vulnerable groups whose income is mostly allocated to basic needs. Rising food prices have been proven to reduce the quality and quantity of household consumption, thereby worsening national food security (Brinkman et al., 2010; Wahyuni, 2020).

Per capita income plays an important role as an indicator of people's purchasing power and access to nutritious food. Countries with high per capita income have advantages in accessing quality food, health services, and nutritional knowledge, so they have the opportunity to improve overall food security. Conversely, low per capita income is a limiting factor in access to healthy food, increasing the risk of food vulnerability in developing countries (Drewnowski & Darmon, 2005; Kenny et al., 2018; World Bank, 2022).

Consumer spending in the context of food reflects people's consumption patterns on the type and quality of food. Consumer spending preferences on healthy foods will encourage producers to provide nutritious and high-quality food, while more consumption patterns lead to cheap and unhealthy foods will magnify food security issues (Kotler, 2020; Chung & Myers Jr., 1999).

The conceptual model used in this study describes the causal relationship between three independent variables—namely food inflation (X1), per capita income (X2), and consumer spending (X3)—and the dependent variable, namely food security (Y). Theoretically, food inflation is expected to have a negative effect on food security, while per capita income and consumer spending are expected to have a positive effect. This relationship can also be influenced by moderation factors, such as government policies and food infrastructure, which are variables outside the model (Brinkman et al., 2010; FAO, 1996; Wahyuni, 2020).

Thus, this theoretical framework confirms that the interaction between food inflation, per capita income, and consumer spending simultaneously affects food security, so it is important to comprehensively analyze the relationship between these variables in the context of the ASEAN region. This conceptual model is the basis for testing hypotheses and formulating evidence-based policy recommendations to improve food security in the ASEAN region.

3. RESEARCH METHODOLOGY

3.1. Scope of Analysis

This study focuses on the analysis of four ASEAN countries, namely Indonesia, Malaysia, Singapore, and Thailand, during the period 2013 to 2022. The selection of these four countries is based on the consideration that they represent a variety of economic conditions, per capita income levels, food policies, and food security challenges in the ASEAN region. Indonesia was chosen as the country with the largest population and complex food distribution challenges; Malaysia and Thailand as agrarian countries with developed agricultural sectors but still face price and productivity fluctuations; and Singapore as a developed country that is highly dependent on food imports but is able to maintain the highest level of food security in ASEAN through diversification policies and distribution efficiency. By selecting these countries, the research gained sufficient scope to conduct comparative analysis and policy generalizations in the diverse ASEAN context.

The 2013–2022 period was chosen because it includes significant economic dynamics, such as fluctuations in global food prices, changes in economic policies after the financial crisis, and disruptions due to the COVID-19 pandemic that have had a major impact on regional and global food systems (World Bank, 2022; FAO, 2023). The ten-year time span is considered adequate to capture medium- to long-term trends, allowing for a more robust analysis of changes in macroeconomic variables related to food security.

This study uses secondary data from official sources, including the Food and Agriculture Organization (FAO), the World Bank (World Bank), the Economist Intelligence Unit, and the Central Statistics Agency (BPS), to ensure the accuracy and comparability of data across countries and research years. The panel data method was chosen because it is able to analyze data across time and across countries simultaneously, so that it can explore the influence of food inflation variables, per capita income, and consumer spending on food security more comprehensively and control the individual heterogeneity of each country (Baltagi, 2021).

With this scope and approach, the research is expected to provide a representative and relevant understanding of the relationship of macroeconomic variables to food security and produce policy recommendations that are applicable to ASEAN countries in facing food security challenges in the future.

3.2. Data Types and Sources

This research uses secondary data collected through literature studies and documentation from official and credible sources, such as the Food and Agriculture Organization (FAO), the World Bank, the Economist Intelligence Unit, Trading Economics, and the Central Statistics Agency (BPS) for the period 2013–2022. The data collected included indicators of food security, food inflation rate, per capita income, and consumer spending from four ASEAN countries, namely Indonesia, Malaysia, Singapore, and Thailand.

The data obtained was analyzed using a data panel approach, which is a method that combines time series data and cross-section data, so as to allow the analysis of the relationship between variables between countries and between years simultaneously. The first step in the analysis process is to conduct a diagnostic test to determine the most suitable data panel model, namely whether it is a Common Effect, Fixed Effect, or Random Effect model. For this reason, a series of model selection tests were carried out, namely the Chow Test to compare Common Effect and Fixed Effect models, and the Hausman Test to determine whether the Fixed Effect or Random Effect model is more

appropriately used. In addition, a Lagrange Multiplier (LM) Test was also carried out to compare Common Effect and Random Effect models.

After the best model was selected based on the test results, a panel regression analysis was conducted to evaluate the influence of food inflation, per capita income, and consumer spending on food security in the ASEAN countries that were the object of the study. The data were analyzed descriptively to provide an overview of the development of variables during the study period, as well as quantitatively through significance tests and regression coefficient estimation to test the research hypothesis and assess the strength and direction of the relationship between variables.

With this systematic analysis stage, the research can ensure the validity of the results obtained and the relevance of policies that can be recommended for ASEAN countries in strengthening food security in the future.

3.3. Operationalization of Research Variables

The following is the operationalization of the research variables, as follows:

No.	Variabel	Operational Definition	Formula	Unit of Measurement
1	Food Inflation	The average price increase of a number of staple food commodities in a given period (e.g., annual) compared to previous period.	(Current Year Per Capita Income Index / Previous Year Per Capita Income Index - 1) x 100	Percentage (%)
2	Per Capita Income	A measurement used to calculate the average income received by each individual within a country or region in a year	Total State Income in One Year / Number of Population in the same year	USD ($)
3	Consumer Shopping	Household expenditure to buy consumer goods and services in a certain period.	Total Household Expenditure on Food / Total Household Expenses	USD ($)
4	Food Security of ASEAN Countries	The ability of a State to provide sufficient, safe, nutritious and affordable food for all its population on an ongoing basis.	Global Food Security Index	Scale 0-100

Table 1. Operationalization Research Variabels
Source: Researchers

3.4. Data Analysis Methods

This study uses a panel data analysis method that combines time series and cross-sectional data during the period 2013-2022 to assess the influence of food inflation, per capita income, and consumer spending on food security in ASEAN countries. Data were analyzed using descriptive statistics to describe the data in general, and classical assumption tests were performed, which included normality, multicollinearity, heteroscedasticity, and autocorrelation tests. The regression analysis of the panel data was selected after testing the best model using the Chow test, the Hausman test, and the Lagrange Multiplier test. Data processing is carried out with the help of Microsoft Excel software and E-Views 13 Student Version to obtain optimal and unbiased analysis results.

4. RESULT AND DISCUSSION

4.1. Data Description

The data used in this study covers four ASEAN countries, namely Indonesia, Malaysia, Singapore, and Thailand, with a period of 2013 to 2022. The variables analyzed consisted of food security (measured by the Global Food Security Index), food inflation, per capita income, and consumer spending. Data is obtained from official sources such as the Economist Intelligence Unit, Trading Economics, and the World Bank. Each variable shows a diverse trend between countries, with Singapore consistently ranking highest in the food security index. In contrast, Indonesia and Thailand showed fluctuations influenced by food inflation and consumer spending dynamics.

Table 2. Food Security of ASEAN Countries in 2013-2022

Negara	Tahun	Poin IKP	Negara	Tahun	Poin IKP
Indonesia	2013	45.6	Singapura	2013	79.9
	2014	46.5		2014	84.3
	2015	46.7		2015	88.2
	2016	50.6		2016	83.9
	2017	46.5		2017	49.1
	2018	54.8		2018	85.9
	2019	62.6		2019	87.4
	2020	59.5		2020	75.7
	2021	59.2		2021	77.4
	2022	60.2		2022	73.1
Malaysia	2013	64.5	Thailand	2013	58.9
	2014	68		2014	59.9
	2015	69		2015	60
	2016	69		2016	59.5
	2017	52.1		2017	58.3
	2018	68.1		2018	58.9
	2019	73.8		2019	65.1
	2020	67.9		2020	64
	2021	70.1		2021	64.5
	2022	69.9		2022	60.1

Source: Economist Impact https://www.statista.com/statistics/

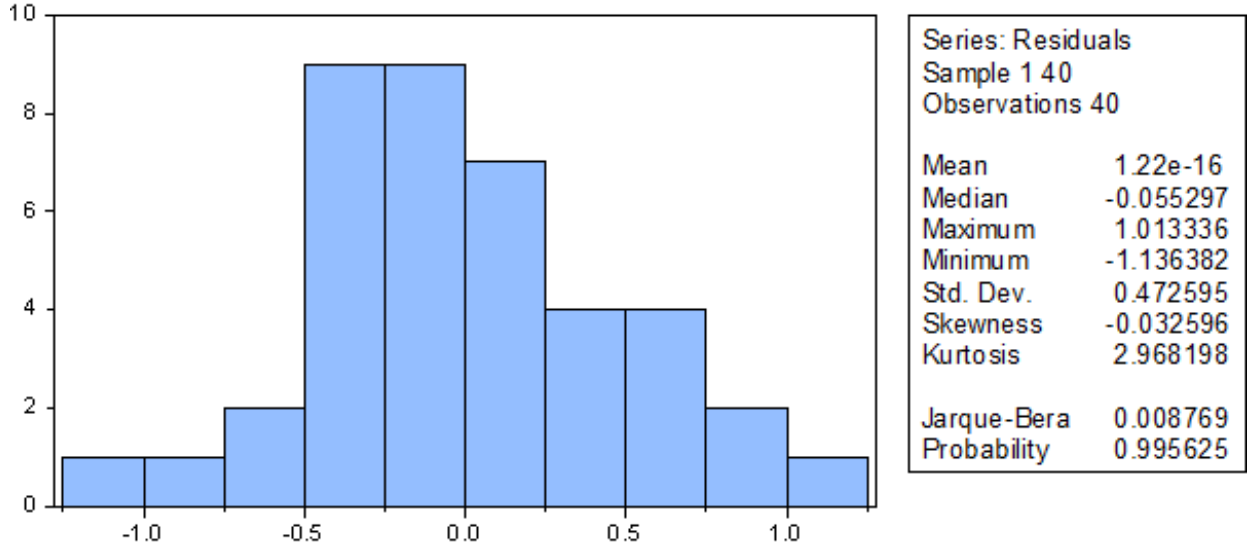
Based on table 2 above, the data shows the food security index of four ASEAN countries (Indonesia, Malaysia, Singapore, and Thailand) from 2013 to 2022. Each country has an index value that reflects food security conditions based on aspects of food availability, accessibility, and stability. Data trends show significant variation between countries, with Singapore consistently recording the highest index values, reflecting better food security than other countries. Indonesia shows index fluctuations, while Malaysia and Thailand have moderate upward trends. This analysis reveals the influence of factors such as food inflation, per capita income, and consumer spending on food security in the region.

Food security data from Indonesia, Malaysia, Singapore, and Thailand show significant variations from 2013 to 2022. Indonesia has fluctuated, with an index high of 62.6 in 2019 and a low of 45.6 in 2013, an increase of 37.0%. Malaysia showed a positive trend, reaching a peak of 73.8 in 2019, although it dropped to 69.9 in 2022. Singapore has been consistently high, reaching 88.2 in 2015, with a decline to 73.1 in 2022. Thailand is relatively stable, with an index high of 65.1 in 2019 and a low of 58.3 in 2017, showing a 4.8% decline from 2013 to 2022.

4.2. Research Results

The results of the panel's data regression analysis show that food inflation, per capita income, and consumer spending together have a significant influence on food security in ASEAN countries (Indonesia, Malaysia, Singapore, and Thailand) during the period 2013–2022. The fixed effect model was chosen as the best model based on the results of the Chow and Hausman tests, which means that the unique characteristics of each country, such as national policies, economic structure, and social conditions, play an important role in influencing the relationship between macroeconomic variables and food security.

Figure 2. Hipotesis Test
Source: E-Views 13 - Researchers



From the image above, it can be concluded that the significance value of 0.995 > 0.05 used freely escaped normality. Based on the multicollinearity test, it shows that there are no symptoms between independent variables, while the heterokedasticity test shows that there are no symptoms of heterokedasticity in the residual and based on the autocorrelation test, it shows that there is no autocorrelation and this can be seen from the following image:

Figure 3. Multicolilinearity Test
Source: E-Views 13 - Researchers

Variance Inflation Factors
Date: 03/07/25 Time: 14:43
Sample: 1 40
Included observations: 40

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.015498	2.562060	NA
IP	0.008581	1.665092	1.538051
PPK	0.021770	3.931224	1.669490
BK	0.017802	1.887690	1.649480

Figure 4. Heterokedasticity Test
Source: E-Views 13 - Researchers

Heteroskedasticity Test: Glejser

F-statistic	1.135613	Prob. F(3,36)	0.3477
Obs*R-squared	3.458120	Prob. Chi-Square(3)	0.3262
Scaled explained SS	3.224447	Prob. Chi-Square(3)	0.3583

Figure 5. Autocorrelation Test
Source: E-Views 13 - Researchers

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.002322	Prob. F(2,34)	0.1506
Obs*R-squared	4.214900	Prob. Chi-Square(2)	0.1215

In the selection of the regression model, this research uses panel data regression. In the data regression panel, there are three models that can be used, namely Common effect, Fixed Effects, and Random Effect. To choose a more appropriate regression model in this study, testing can be carried out using the Chow Test, Hausman Test and Lagrange Multiplier Test.

The results of the Chow Test were carried out to determine a more appropriate regression model to be used between the Common effects model and the Fixed Effects model, for the Hausman Test it was carried out to determine a more appropriate regression model used between the Random Effects model and the Fixed Effects model and for the Lagrange Multiplier test it was carried out to determine a more appropriate regression model used between the Common effects model and the Random Effects model and the following is a table and Conclusions of the Each of the panel data regression models, namely:

Figure 6. Hasil Uji Chow dengan Redudant Test
Source: E-Views 13 - Researchers

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.438084	(3,33)	0.7272
Cross-section Chi-square	1.562127	3	0.6680

Based on the results of the Chow test with the Redundant Test, a chi-square cross-section value of 1.562127 was obtained with a probability of 0.6680 (more than 5%). Since all test models have a statistical probability greater than alpha 0.05, the appropriate model is to use the Common Effect Model.

From the results of the test above, it will be determined whether to use the Fixed Effect or Random Effect model. To be calculated with the Random Effect model which will be compared with the Fixed Effect model using the Hausman test.

Figure 7. Hasil Uji Hausman Test
Source: E-Views 13 – Researchers

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	1.314251	3	0.7258

Based on the table above, the chi-square distribution value is 1.314251 with a chi-square probability of 0.7258 which is more than alpha 0.05 (0.7258 > 0.05), so the right model is to use the Random Effect Model. Thus, based on the Hausman test, the right model for analyzing the data is the Random Effect model rather than the Fixed Effect model.

Figure 8. Hasil Lagrange Multiplier Test
Source: E-Views 13 – Researchers

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided
(all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	0.916488	0.906498	1.822986
	(0.3384)	(0.3410)	(0.1770)

Based on the test results, a cross-section value of 0.916488 was obtained with a probability of 0.3384 (more than 5%). Since the test model has a probability of a statistical probability of less than alpha 0.05, the appropriate model is to use *the Common Effect Model*. In conclusion, in this study, the appropriate model for regression analysis is to use *the Common Effect Model* model.

Figure 9. Common Effects Test Results
Source: E-Views 13 – Processed by Researchers

Dependent Variable: KP
Method: Panel Least Squares
Date: 03/07/25 Time: 14:48
Sample: 2013 2022
Periods included: 10
Cross-sections included: 4
Total panel (balanced) observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.032748	0.124490	-0.263056	0.7940
IP	-0.214144	0.092636	-2.311676	0.0266
PPK	0.302156	0.147545	2.047886	0.0479
BK	0.749143	0.133425	5.614701	0.0000

R-squared	0.767158	Mean dependent var	0.484000
Adjusted R-squared	0.747755	S.D. dependent var	0.979398
S.E. of regression	0.491893	Akaike info criterion	1.513528
Sum squared resid	8.710511	Schwarz criterion	1.682416
Log likelihood	-26.27056	Hannan-Quinn criter.	1.574593
F-statistic	39.53713	Durbin-Watson stat	1.571678
Prob(F-statistic)	0.000000		

Statistically, the three independent variables analyzed were able to explain about 74.7% of the variation in food security in the four countries, while the rest were influenced by other factors outside the study model. This figure shows that fluctuations in food prices, people's income levels, and consumption patterns play a very large role in determining the level of food security, so policies focused on controlling food inflation and increasing income have the potential to have a real impact on improving food security in the ASEAN region.

Partially, food inflation has been proven to have a negative and significant influence on food security. This means that the increase in food prices directly reduces the accessibility and ability of people to get nutritious food, especially low-income groups. Therefore, efforts to control food inflation—through price stabilization, increased distribution efficiency, and support for local food production—are crucial to maintain people's purchasing power and food sufficiency.

Per capita income was found to have a positive and significant effect individually on food security. These findings indicate that increasing people's incomes will strengthen their ability to access quality food and improve overall food security. The policy implications of this outcome are the importance of encouraging inclusive economic growth, job creation, and strengthening the social safety net so that people's incomes increase evenly.

Meanwhile, consumer spending in this study did not show a significant influence on food security partially. This can be due to differences in consumption patterns and spending preferences between countries, or because people's food expenditure is not always in line with access to nutritious food. These findings signal that food security improvement policies are not enough to rely only on increasing purchasing power, but must be supported by nutrition education and food consumption diversification programs.

Thus, the results of this study confirm that efforts to increase food security in ASEAN countries must be focused on controlling food inflation and increasing people's incomes. In addition, policies that take into account the specific characteristics of each country as well as educational interventions to shape healthy food consumption patterns are becoming increasingly important in facing food security challenges in the future.

4.3. Discussion

The results of this study confirm that food inflation has a negative impact on food security in ASEAN countries, in line with the findings of Wahyuni (2020) and Muttaqin et al. (2024) who stated that food price spikes are the main challenge in maintaining food access stability, especially in lower-middle-income countries. However, unlike some previous studies that focused on local or domestic aspects, this study proves that the influence of food inflation remains significant even in cross-country contexts with different economic and policy structures. This shows that although countries such as Singapore have adopted import diversification strategies and technological innovations, the impact of global inflation can still be felt, although relatively more controlled than Indonesia and Thailand.

Furthermore, per capita income has been shown to have a positive and significant effect on food security, supporting the findings of Kenny et al. (2018) and Portia et al. (2019) who stated that increased income strengthens people's access to nutritious food and encourages improvement in national nutritional status. However, these findings also indicate a gap among ASEAN countries, where Singapore and Malaysia are better able to maintain food security due to high incomes, while Indonesia and Thailand still face accessibility and distribution challenges that lead to food security disparities between regions. This context reinforces the argument that the strategy of increasing per capita income must be accompanied by economic equity and access, not just income growth.

Interestingly, in contrast to several studies such as Roessali et al. (2019) which highlighted the importance of consumer spending on food security, in this research model, consumer spending is not statistically significant. This indicates that an increase in household spending on food does not automatically guarantee food security, especially if it is not accompanied by a change in consumption patterns towards nutritious and diverse foods. These findings contradict research that emphasizes consumption as a key determinant, and sends the message that policy interventions need not only to boost purchasing power, but also improve people's education and consumption preferences.

Critically, the results of this study add to the empirical evidence that the strategy to strengthen food security in ASEAN cannot rely only on one economic variable, but requires a holistic approach that combines food price stabilization, inclusive economic growth, and nutrition-based consumption management. The diversity of policies among ASEAN countries also shows the need for the exchange of best practices and regional synergies so that food security can be achieved equally in the region.

5. CONCLUSION

The study confirms that food inflation, per capita income, and consumer spending simultaneously affected food security in ASEAN countries during 2013-2022, with food inflation and per capita income proven to have a partially significant effect, while consumer spending was insignificant. These findings suggest that about 74.7% of food security variations can be explained by these three variables, while the rest are influenced by other factors outside the model.

As a policy implication, the results of this study demand an integrated strategy at the national and regional levels. ASEAN governments need to prioritize food inflation control policies, such as stabilizing strategic commodity prices, strengthening national food reserves, and improving distribution and logistics efficiency, especially for countries with high price volatility such as Indonesia and Thailand. To support the increase in per capita income, inclusive economic development policies, job creation in the agriculture and food sectors, and investment in vocational education and training are needed, especially in countries with large income gaps and food access.

On the other hand, the meaninglessness of consumer spending as a partial variable shows the need for intervention on the demand side, namely through nutrition education and the promotion of affordable and diverse healthy food consumption. The government can facilitate healthy eating campaigns and expand access to nutritious food through subsidy programs, low-cost food distribution, and strengthening local food security, so that people's purchasing power can really increase food security, not just quantity consumption.

Prospectively, this research underscores the importance of cross-border policy synergy in ASEAN, for example through the harmonization of food trade regulations, the exchange of best practices on food security, and the strengthening of research cooperation between countries. Further studies can be directed at the exploration of other variables such as climate change, agricultural technology innovation, urbanization, as well as the impact of global crises (e.g. pandemics or geopolitics) on food systems. Further research is also recommended to examine the role of social policies, food infrastructure, and consumption dynamics in all community groups so that the food security strategy formulated is truly adaptive and inclusive for the entire ASEAN region.

Based on Singapore's experience, other ASEAN countries such as Indonesia, Malaysia, and Thailand can learn valuable lessons by implementing diversification of food imports, increasing people's purchasing power through strategic economic policies, and improving people's consumption patterns through education and campaigns on the importance of nutritious food. Thus, this combination of strategies is expected to increase overall food security in the ASEAN region.

The Singapore case study provides a vivid illustration of the effective implementation of these three factors. Despite its reliance on food imports, Singapore has been able to keep inflation under control with open trade policies and extensive import diversification. The country also has a high per capita income, allowing people's purchasing power for nutritious food to remain stable. Excellent logistics infrastructure and consumer spending patterns that tend to be high-quality products have also strengthened the country's food security. Therefore, other ASEAN countries, such as Indonesia, Malaysia, and Thailand, can learn from Singapore by strengthening import diversification policies, increasing people's purchasing power, and improving food consumption patterns through better education to strengthen food security in a sustainable manner.

REFERENCES

A.W, V. T., Fitriyani, A. E., Febrianti, M., Lesmana, M. E., Lukman, R. M., & Budiasih, B. (2023). Pengaruh Konsumsi Masyarakat Indonesia terhadap Ketahanan Pangan Nasional. Seminar Nasional Official Statistics, 2023(1), 525–536. https://doi.org/10.34123/semnasoffstat.v2023i1.1711

ADB (Asian Development Bank). (2023). Inequality in Asia: Causes and Consequences. Manila: ADB.

Afifuddin, M. (2022). Subjek-Subjek Algoritmik: Perspektif Sosiologi Tentang Dunia Digital. Bantul: Jejak Pustaka.

Akter, S., & Basher, S. A. (2014). The impacts of food price and income shocks on household food security and economic well-being: Evidence from rural Bangladesh. Global Environmental Change, 25, 150–162.

Alna, A. P. (2024). Pengaruh Inflasi Terhadap Tingkat Penganguran Terbuka Di Kota Sukabumi . Jurnal Ekonomi dan Manajemen Vol.1 No.2 Juni 2024, 146-157.

Alisjahbana, A., & Yusuf, A. (2020). Income Inequality and Economic Growth in Indonesia. Bulletin of Indonesian Economic Studies, 56(3), 267-283

Anderson, M. D. (2008). Rights-based food systems and the goals of food systems reform. Agriculture and Human Values, 25(4), 593-608. https://doi.org/10.1007/s10460-008-9151-z

Andriani. (2022). Perubahan Pola Konsumsi Masyarakat Sebelum Dan Sesudah Masa Pandemi COVID-19. Eksis.

Arellano, M. (1993). On the testing of correlated effects with panel data. Journal of Econometrics, 59(1-2), 87-97. https://doi.org/10.1016/0304-4076(93)90040-C

Asian Development Bank (ADB). (2023). Inequality in Asia: Causes and Consequences. Manila: ADB.

Azhar, A. L., Suliyanto, S., Chamidah, N., Ana, E., & Amelia, D. (2023). Pemodelan Indeks Ketahanan Pangan di Indonesia Berdasarkan Pendekatan Regresi Logistik Ordinal Data Panel Efek Acak. Jurnal Ketahanan Nasional, 29(2), 166. https://doi.org/10.22146/jkn.86511

Badan Pusat Statistik (BPS). (2023). Statistik Sosial dan Ekonomi. Jakarta: BPS.

Baffes, J., & Fane, G. (2021). Food Price Dynamics: Understanding the Impact of Global Events. World Bank Economic Review, 35(3), 677-698.

Baltagi, B. H., Feng, Q., & Kao, C. (2012). A Lagrange Multiplier test for cross-sectional dependence in a Fixed Effects panel data model. Journal of Econometrics, 170(1), 164-177. https://doi.org/10.1016/j.jeconom.2012.04.004

Bogmans, C. (2024). How do Economic Growth and Food Inflation Affect Food Insecurity? IMF Working Papers, 2024(188), 1. https://doi.org/10.5089/9798400287336.001

Bozsik, N., Cubillos, T. J. P., Stalbek, B., Vasa, L., & Magda, R. (2022). Food security management in developing countries: Influence of economic factors on their food availability and access. PloS One, 17(7), e0271696. https://doi.org/10.1371/journal.pone.0271696

Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. Econometrica, 47(5), 1287-1294. https://doi.org/10.2307/1911963

Brinkman, H.-J., De Pee, S., Sanogo, I., Subran, L., & Bloem, M. W. (2010a). High food prices and the global financial crisis have reduced access to nutritious food and worsened nutritional status and health. The Journal of Nutrition, 140(1), 153S-161S. https://doi.org/10.3945/jn.109.110767

Burchi, F., & De Muro, P. (2012). A human development and capability approach to food security: Conceptual framework and informational basis. Background Paper, 8.

Christianingrum, R. &. (2019). Faktor-Faktor Yang Memengaruhi Inflasi Inti Di Indonesia. Jurnal Budget.

Chung, C., & Myers Jr, S. L. (1999). Do the poor pay more for food? An analysis of grocery store availability and food price disparities. Journal of Consumer Affairs, 33(2), 276-296. https://doi.org/10.1111/j.1745-6606.1999.tb00071.x

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2018). Household Food Security in the United States in 2018. www.ers.usda.gov

Compton, J., Wiggins, S., & Keats, S. (2010). Impact of the global food crisis on the poor: what is the evidence. London: Overseas Development Institute.

Cooksey, R. W. (2020). Descriptive statistics for summarising data. In Illustrating Statistical Procedures: Finding Meaning in Quantitative Data (pp. 61-139). Springer. https://doi.org/10.1007/978-981-15-2537-7_5

Devi, L. Y. (2020). Model sosial ekonomi dan ketahanan pangan rumah tangga di Indonesia. Jurnal Ekonomi Dan Pembangunan, 28(2), 103-115.

Dewanti, S. (2020). Keragaman Konsumsi Pangan Rumah Tangga di Provinsi Jawa Tengah. Jurnal Kawistara, 10(3), 282. https://doi.org/10.22146/kawistara.46787

Dowler, E. A., Kneafsey, M., Lambie, H., Inman, A., Collier, R., & Dowler, E. (2011). Thinking about "food security": engaging with UK consumers. http://www.tandf.co.uk/journals/titles/09581596.asp;

Drewnowski, A., & Darmon, N. (2005). Food choices and diet costs: An economic analysis. The Journal of Nutrition, 135(4), 900-904. https://doi.org/10.1093/jn/135.4.900

Edgerton, D., & Shukur, G. (1999). Testing autocorrelation in a system perspective. Econometric RE-views, 18(4), 343-386. https://doi.org/10.1080/07474939908800351

Erokhin, V., & Gao, T. (2020). Impacts of COVID-19 on trade and economic aspects of food security: Evidence from 45 developing countries. International Journal of Environmental Research and Public Health, 17(16), 5775. https://doi.org/10.3390/ijerph17165775

Erokhin, V., & Gao, T. (2020). Impacts of COVID-19 on trade and economic aspects of food security: Evidence from 45 developing countries. International Journal of Environmental Research and Public Health, 17(16), 5775.

Farrar, D. E., & Glauber, R. R. (1967). Multicollinearity in regression analysis: The problem revisited. The Review of Economics and Statistics, 49(1), 92-107. https://doi.org/10.2307/1937887

Farsund, A. A., Daugbjerg, C., & Langhelle, O. (2015). Food security and trade: Reconciling discourses in the Food and Agriculture Organization and the World Trade Organization. Food Security, 7(2), 383-391. https://doi.org/10.1007/s12571-015-0428-y

Fauzan, H. (2023). Perilaku Konsumtif Mahasiswa Terhadap Jual Beli Online Dalam Perspektif Islam. Business and Management Journal, 64-75.

Firdaus, M. (2021). Disparitas Harga Pangan Strategis Sebelum dan Saat Pandemi COVID-19. Jurnal Ekonomi Indonesia, 10(2), 107–120. https://doi.org/10.52813/jei.v10i2.104

Fikriman. (2020). Indikator Yang Mempengaruhi Tingkat Ketahanan Pangan Di Kabupaten Bungo Provinsi Jambi. Jurnal Galung Tropika, 9 (3), 348 - 355.

Geisser, S. (1974). A predictive approach to the Random Effect Model. Biometrika, 61(1), 101-107. https://doi.org/10.1093/biomet/61.1.101

Ginting, N., & Adji, S. (2022). Poverty and Income Inequality in Indonesia: A Review. Indonesian Journal of Economics and Business, 1(2), 12-24.

Green, R., Cornelsen, L., Dangour, A. D., Turner, R., Shankar, B., Mazzocchi, M., & Smith, R. D. (2013). The effect of rising food prices on food consumption: Systematic review with meta-regression. BMJ, 346. https://doi.org/10.1136/bmj.f3703

Greenland, S., & Robins, J. M. (1985). Estimation of a Common effect parameter from sparse follow-up data. Biometrics, 41(1), 55-68. https://doi.org/10.2307/2530643

Gujarati, D. N. (2021). Essentials of econometrics. Sage Publications.

Hadi, S. (2020). Food Security and Food Safety in Indonesia. Journal of Food Security, 12(2), 100-110.

Hafid, H., Soekartono, & Purnomo, H. (2020). The Role of Human Capital in Economic Growth in Southeast Asia. Jurnal Ekonomi Pembangunan, 18(1), 1-15.

Harris, J., Nguyen, P. H., Tran, L. M., & Huynh, P. N. (2020). Nutrition transition in Vietnam: Changing food supply, food prices, household expenditure, diet and nutrition outcomes. Food Security, 12(5), 1141-1155. https://doi.org/10.1007/s12571-020-01096-x

Hedges, L. V. (1994). Fixed Effects models. In The Handbook of Research Synthesis (pp. 285-299). Russell Sage Foundation.

Huang, L.-S., & Chen, J. (2008). Analysis of variance, coefficient of determination and F-test for local polynomial regression. The Annals of Statistics, 36(4), 1609-1635. https://doi.org/10.1214/07-AOS531

Jones, A. D., Ngure, F. M., Pelto, G., & Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. Advances in Nutrition, 4(5), 481-505. https://doi.org/10.3945/an.113.004119

Kalaba, Y., Wildani Pingkan S, H., Erny, Damayanti, L., Akrab, A., Yusuf, R., Nurdin, M. F., & Walalangi, J. Y. (2022). Analysis of household food security based on the share of food expenditure in central Sulawesi Indonesia. IOP Conference Series: Earth and Environmental Science, 1107(1). https://doi.org/10.1088/1755-1315/1107/1/012090

Karagöz, A., & Kandemir, O. (2023). The Impacts of Pandemic on Food Security and Food Inflation. Turkish Journal of Agriculture - Food Science and Technology, 11(8), 1285–1297. https://doi.org/10.24925/turjaf.v11i8.1285-1297.5717

Kenny, T.-A., Fillion, M., MacLean, J., Wesche, S. D., & Chan, H. M. (2018). Calories are cheap, nutrients are expensive: The challenge of healthy living in Arctic communities. Food Policy, 80, 39-54. https://doi.org/10.1016/j.foodpol.2018.08.006

Khan, M. N., & Suksawad, W. (2022). Inflation Dynamics and Food Prices in Thailand. Journal of Economics and Management, 18(2), 123-135.

Khan, M. N., Wang, Y., & Ali, H. (2021). Climate Change and Food Security in Thailand. Asian Journal of Agriculture and Development, 18(1), 75-88.

Kim, T. K. (2015). T test as a parametric statistic. Korean Journal of Anesthesiology, 68(6), 540-546. https://doi.org/10.4097/kjae.2015.68.6.540

Kotler, P. &. (2020). Marketing Management (15th ed.). New London: Pearson Pretice Hall.

Koto, J. (2016). Analisis Pengaruh Pad, Dau Dan Dak Terhadap Kemiskinan Pada Kabupaten/Kota Di Provinsi Sumatera Barat Dengan Pertumbuhan Ekonomi Sebagai Variabel Intervening. Journal of Economic and Economic Education Vol, 4(2), 192-209.

Kubitza, C., Hackfort, S., Opiyo, A., Rauh, C., Stokes, C. S., & Huyskens-Keil, S. (2024). The effects of market-oriented farming on living standards, nutrition, and informal sharing arrangements of smallholder farmers: the case of African indigenous vegetables in Kenya. Food Security. https://doi.org/10.1007/s12571-024-01480-x

Kumar, R., Sharma, S., & Verma, A. (2022). Rising Food Prices and Global Food Security. Global Food Security, 32, 100556.

Kumareswaran, K., & Jayasinghe, G. Y. (2022). Systematic review on ensuring the global food security and covid-19 pandemic resilient food systems: Towards accomplishing sustainable development goals targets. Discover Sustainability, 3(1), 29. https://doi.org/10.1007/s43621-022-00096-5

Linggi, M. (2024). Pengaruh Inflasi, Suku Bunga, Dan Nilai Tukar Rupiah Terhadap Harga Sahampada Perusahaan Sub Sektor Transportasi Yang Terdaftar Di Bursa Efek Indonesia Periode 2018-2022. Jurnal NERACA PERADABAN, 89-95.

Lopez, C., & Ramos, R. (2019). Food Price Inflation and Its Socioeconomic Makbul, Y. F. (2019). Infrastructure development and food security in Indonesia: The impact of the trans-Java toll road on rice paddy farmers' desire to sell farmland. Journal of Regional and City Planning, 30(2), 140-156.

Mardiah, D. &. (2019). Implementasi Kebijakan Ketahanan Pangan: Studi Kasus di Kabupaten Pasaman Barat, Provinsi Sumatera Barat. Jurnal Agribisnis Indonesia (JAI), 7(2), 147-158.

Marina, I. (2024). Dinamika Pasar Komoditas Pangan Strategis: Analisis Fluktuasi Harga Dan Produksi. Paspalum: Jurnal Ilmiah Pertanian, 160-168.

Marina, I. H. (2022). Development of the Administration of the Sukahaji Mandiri Community of Sukahaji Food Group Groups in Supporting Orderly Administration. BERNAS: Jurnal Pengabdian Kepada Masyarakat, 3(3), 369-374.Impacts in the Philippines. Philippine Journal of Development, 42(1), 1-20.

Martinez, J., & López, M. (2023). Food Price Volatility and Its Implications for Households. Journal of Consumer Affairs, 57(1), 203-220.

Maryuniata, Y. D. (2020). Pengaruh Harga Komoditi Pangan Terhadap Inflasi Di Kota Medan. Agrica Jurnal Agribisnis Sumatera Utara, Vol.13 No.1.

Matz, J. A., Kalkuhl, M., & Abegaz, G. A. (2015). The short-term impact of price shocks on food security-Evidence from urban and rural Ethiopia. Food Security, 7(3), 657–679. https://doi.org/10.1007/s12571-015-0467-4

Mubarakkan, M. T. (2012). Produktivitas dan mutu jagung hibrida pengembangan dari jagung lokal pada kondisi input rendah sebagai sumber bahan pakan ternak ayam. Jurnal Penelitian Pengelolaan Sumberdaya Alam dan Lingkungan, 1(1), 67-74.

Nainggolan, K. (2008). Ketahanan dan stabilitas pasokan, permintaan, dan harga komoditas pangan. Analisis Kebijakan Pertanian, 6(2), 114-139.

Naylor, R. L., & Falcon, W. P. (2010). Food security in an era of economic volatility. Population and Development Review, 36(4), 693-723. https://doi.org/10.1111/j.1728-4457.2010.00354.x

Neilson, J., & Wright, J. (2017). The state and food security discourses of Indonesia: feeding the bangsa. Geographical Research, 55(2), 131–143. https://doi.org/10.1111/1745-5871.12210

Novia, A. (2024). Pengaruh Inflasi Dan Tingkat Pengangguran Terhadap Pertumbuhan Ekonomi Di Provinsi Banten Periode 2018-2022. Jurnal Ekonomi, Manajemen dan Akuntansi, 287–299.

Nguyen, H. T. (2023). Agricultural Policies and Food Security in Southeast Asia. Asian Economic Policy Review, 18(2), 139-158.

Nguyen, H. T. (2023). Examining the Role of Agricultural Policies in Controlling Food Inflation in Vietnam. Journal of Agricultural Economics, 12(1), 101-115.

Obiora, C. U., Ezeh, M. C., George, C. I., Orjiakor, S. N., Anigbogu, C. B., Nwabude, C. G., & Omologbe, F. (2023). The impacts of inflation on food security in Nigeria: A review. Asian Journal of Food Research and Nutrition, 2(4), 476-496.

OECD (Organisation for Economic Co-operation and Development). (2021). Economic Surveys: Indonesia 2021. Paris: OECD Publishing

Ozer, D. J. (1985). Correlation and the coefficient of determination. Psychological Bulletin, 97(2), 307-315. https://doi.org/10.1037/0033-2909.97.2.307

Pratiwi, D. &. (2020). Analisis Faktor-Faktor yang Mempengaruhi Harga Cabai di Kabupaten Sambas. Jurnal Agro Ekonomi, 31(2), 133-146.

Poulsen, M. N., McNab, P. R., Clayton, M. L., & Neff, R. A. (2015). A systematic review of urban agriculture and food security impacts in low-income countries. Food Policy, 55, 131–146.

Pujadi, A. (2022). Inflasi: Teori Dan Kebijakan. Jurnal Manajemen Diversitas, 2(2), 73–77.

Purnawan, E. B. (2021). Financial support program for small farmers, and its impact on local food security. Evidence from Indonesia. Horticulturae, 7(12), 546.

Putri, S., & Rahayu, P. (2021). The Role of Education in Reducing Income Inequality in Indonesia. Journal of Indonesian Economy and Business, 36(2), 135-150.

Rahman, M. M., Ahmad, M. A., & Noor, M. A. (2019). Assessment of Food Security in Malaysia. Malaysian Journal of Agricultural Economics, 15(1), 45-60.

Rahman, M. M., Hashim, A., & Hossain, M. (2020). The Effects of Global Commodity Prices on Food Inflation in Malaysia. International Journal of Economics and Finance Studies, 12(1), 43-58.

Riyono, J. P. (2022). Forecasting Laju Inflasi Indonesia Menggunakan Rantai Markov. Jurnal Sains Matematika dan Statistika, 8(1), 1-12.

Russell. (2018). Assessing food security using household consumption expenditure surveys. Public Health Nutrition, 21(12), 220–2210.

Sangadji, E. M., & Sopiah. (2013). Perilaku Konsumen. Yogyakarta. Andi.

Sari, D., & Prabowo, M. (2021). Food Inflation and Its Impact on Food Security in Indonesia. Indonesian Journal of Economics and Business, 6(3), 210-225.

Saputro, W. A. (2020). Faktor-faktor yang mempengaruhi ketahanan pangan rumah tangga petani di Kabupaten Klaten. Jurnal Agrica, 13(2), 115-123.

Sheytanova, T. (2015). The accuracy of the Hausman test in panel data: A Monte Carlo study. Stockholm University.

Sholeha, L. S. (2018). “Pengaruh Kualitas Pelayanan Terhadap Kepuasan Pelanggan Di Ahass Sumber Jaya Maha Sakti Kecamatan Rogojampi Kabupaten Banyuwangi”. JURNAL PENDIDIKAN EKONOMI: Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi Dan Ilmu Sosial 12 (1): 15, 92., J., & Brown, A. (2020). Consumer Behavior and Shopping Habits in the Digital Age. Journal of Consumer Research, 47(3), 450-466.

Sukmawati, D. &. (2020). Off Season Planting System as Supply Function in Chili Pepper Availability (An Analysis of Rational Expectation Model in Red Curly Chili Pepper Farming (Capsicum Annum L) in Cikajang, Garut Regency. Icasseth, 4-6.

Sukmawati, D. D. (2023). Changes in Subsidized Fertilizer Policy on Factors of Production and Farm Income of Red Chili (Capsicum Annuum L). Cianjur Regency, 1(3), 246–252.Tan, S. & Cheong, P. (2022). Urban Food Security in Singapore. Sustainable Cities and Society, 77, 103553.

Thadewald, T., & Büning, H. (2007). Jarque-Bera test and its competitors for testing normality: A power comparison. Journal of Applied Statistics, 34(1), 87-105. https://doi.org/10.1080/02664760600994539

Thomas, S. L., & Heck, R. H. (2001). Analysis of large-scale secondary data in higher education research: Potential perils associated with complex sampling designs. Research in Higher Education, 42(5), 517-540. https://doi.org/10.1023/A:1011098109834

Thompson, A., Wilson, T., & Smith, R. (2022). The Role of Agricultural Technology in Stabilizing Food Prices. Agricultural Economics, 53(4), 675-689.

Toromade, A. S., Soyombo, D. A., Kupa, E., & Ijomah, T. I. (2024). Reviewing the impact of climate change on global food security: Challenges and solutions. International Journal of Applied Research in Social Sciences, 6(7), 1403-1416. https://doi.org/10.51594/ijarss.v6i7.1300

UNDP (United Nations Development Programme). (2020). Human Development Report 2020. New York: UNDP

Wahyuni, N. (2020). Indikator Harga Pangan Kaitannya Dengan Potensi Pertanian Dan Industri Rumahtangga Dalam Rangka Mewujudkan Ketahanan Pangan Di Kota Lubuklinggau. JASEP, Vol. 6 No. 2, Desember 2020, 42-52.

Wahyuni, T. S. (2024). Pengaruh Fluktuasi Harga Cabai Rawit Merah Terhadap Inflasi di Kabupaten Banyumas. Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis, 1866-1877.

World Bank. (2022). Indonesia Economic Prospects: Rebalancing for Growth. Washington, D.C.: World Bank.

Yulita, N. N. (2024). Pengaruh Pendapatan, Pinjaman, Literasi Ekonomi, dan Gaya Hidup terhadap Pengeluaran Konsumsi Rumah Tangga di Desa Mojosari Kecamatan Kras Kabupaten Kediri. Al-Kharaj: Jurnal Ekonomi, Keuangan & Bisnis Syariah, 1065-1081.

Zhang, X., & Wang, L. (2021). The Impact of Climate Change on Food Prices: Evidence from Global Data. Global Environmental Change, 68, 102244