

Cayenne pepper and shallot price volatility, inflation, and regional economic growth in Palopo City: An Islamic economics perspective

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ABSTRACT

Introduction

Price fluctuations in strategic food commodities can influence inflation, household purchasing power, producer income, and regional economic growth. In Palopo City, cayenne pepper and shallots are widely consumed and traded, making their price movements important for local economic stability. However, city-level studies that integrate commodity price volatility, inflation transmission, regional growth, and Islamic economic insights remain limited.

Objectives

This study analyzes fluctuations in cayenne pepper and shallot prices, examines their relationship with inflation and economic growth in Palopo City, and identifies relevant stabilization measures. It also interprets the findings through Islamic economic principles, including public welfare, wealth protection, fair market governance, and the prevention of hoarding.

Method

The study employed a quantitative explanatory design using annual secondary data for 2021–2025. The variables included average cayenne pepper prices, shallot prices, inflation, and regional economic growth measured through Gross Regional Domestic Product growth. Descriptive trend analysis was combined with multiple linear regression to assess the simultaneous relationship between commodity prices, inflation, and economic growth.

Results

Cayenne pepper prices showed an overall upward trend and reached their highest level in 2025, while shallot prices declined sharply in 2023 before recovering. Inflation peaked in 2022 and increased moderately again in 2025. Cayenne pepper prices

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appeared more closely associated with short-term inflationary movements than shallot prices. The regression analysis indicated that cayenne pepper prices, shallot prices, and inflation were jointly associated with regional economic growth. The findings also showed that production conditions, weather, input availability, distribution constraints, seasonal demand, and policy responses shaped commodity price movements.

Implications

Regional price stabilization should combine improved production planning, shorter distribution chains, stronger logistics and storage, market operations, digital price information, and coordinated action among farmers, traders, distributors, and government agencies. Islamic economic principles support such intervention when it protects consumers and producers without eliminating legitimate market incentives.

Originality/Novelty

This study contributes city-level evidence by integrating commodity-specific price fluctuations, inflation, regional economic growth, and Islamic economic perspectives within the post-pandemic context of Palopo City.

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INTRODUCTION

Strategic food-price volatility has become an increasingly important concern in developing economies because food occupies a substantial share of household expenditure and directly shapes inflation, real income, and welfare. Recent international studies show that commodity-price shocks can pass through to consumer prices with varying intensity depending on the weight of food in the consumer price index, domestic market structure, exchange-rate movements, and the credibility of stabilization policies (Ibrahim & Nghiem, 2025; Jiménez-Rodríguez & Morales-Zumaquero, 2022). The consequences are particularly severe for lower-income households, whose limited substitution options make them more vulnerable to food-price increases and purchasing-power losses (Headey et al., 2024). At the same time, higher agricultural prices may create incentives for producers to expand output and investment, although such benefits depend on credit access, production capacity, and the efficiency of local value chains (Headey & Hirvonen, 2023). These contrasting effects make food-price volatility central to regional economic management.

In Indonesia, cayenne pepper and shallots are strategic horticultural commodities whose prices frequently fluctuate because of climatic shocks, harvest cycles, production costs, logistics constraints, and seasonal demand. Their importance is

especially pronounced in urban economies where both commodities are widely consumed by households and food-service businesses. Evidence from South Sulawesi indicates that chili production and prices are strongly influenced by supply conditions, planting seasons, and distribution efficiency (Amin & Prihantini, 2021; Rasidin et al., 2022). Comparable studies also identify trader purchasing prices, consumer demand, supply levels, and production risks as significant determinants of cayenne pepper prices (Rahmat et al., 2024; Swastika et al., 2022). In Palopo City, these dynamics matter because food, beverages, and tobacco contribute substantially to local inflation, while household consumption remains a major driver of regional economic activity. Consequently, persistent price instability may affect not only food affordability but also the broader trajectory of local economic growth.

The central problem is that fluctuations in cayenne pepper and shallot prices may generate multiple and potentially conflicting effects across the regional economy. Rising prices can increase farmers' revenues when production remains stable, yet they can simultaneously reduce consumer purchasing power, raise food-service costs, and weaken demand for nonfood goods. Through cost-push and pass-through mechanisms, these commodity shocks may contribute to inflation, which can further reduce real household income and alter consumption and investment decisions (Amam et al., 2025; Anisah et al., 2021; Hafied et al., 2022; Kusnadi & Shofwan, 2017). The problem is therefore not limited to price movements themselves, but concerns the transmission of those movements through inflation, household expenditure, producer income, and market expectations. In Palopo City, where cayenne pepper and shallots are regularly consumed and traded, understanding this transmission is essential for determining whether commodity-price changes support agricultural incentives or instead undermine economic stability and inclusive regional growth.

A general response to this problem requires an integrated framework that combines supply-demand analysis, food-inflation transmission, household consumption theory, and regional growth theory. Supply disruptions caused by extreme weather, pests, or delayed distribution can reduce market availability and raise prices, while demand surges during Ramadan, Eid al-Fitr, Christmas, and New Year can intensify temporary scarcity. When these increases are transmitted to the consumer price index, households may reallocate expenditure away from services, durable goods, or savings, thereby weakening aggregate demand. Conversely, stable and remunerative prices can encourage farmers to invest in inputs, productivity, storage, and market participation. Recent literature therefore emphasizes that the effect of food-price shocks depends on market integration, supply-chain resilience, substitution possibilities, policy credibility, and social protection (Faccia et al., 2021; Liao et al., 2025). A comprehensive analysis must accordingly connect commodity-specific price movements with inflation and regional economic performance rather than treating them as separate issues.

Previous studies propose several specific solutions for reducing horticultural price volatility and its adverse consequences. Strengthening supply chains, shortening distribution channels, improving road and logistics infrastructure, and investing in

storage and cold-chain facilities can reduce post-harvest losses and limit spatial price disparities (Aliyanti, 2022; Mutmainah & Romadhon, 2023; Takhim et al., 2025). Digital market-information systems can also reduce information asymmetry by giving farmers, traders, consumers, and policymakers real-time access to prices, stock levels, and expected shortages (Bahn et al., 2021; Tripathi et al., 2022). Market operations and strategic reserves may provide temporary relief during exceptional price spikes, while scheduled planting, crop diversification, improved seed access, and climate-resilient production can strengthen medium-term supply stability. Research on Indonesian food markets also highlights the value of farmer cooperatives, contract farming, and transparent price reporting for improving bargaining power and reducing excessive intermediation (A. W. Putra et al., 2021; J. E. Putra et al., 2021; Rifin et al., 2023). These measures are most effective when interventions are targeted, time-bound, and supported by reliable local data.

Islamic economics adds an ethical and institutional dimension to these policy solutions. Market exchange is recognized as legitimate, but it must operate within the principles of justice, transparency, mutual benefit, and public welfare. Fair pricing does not necessarily require permanent price controls; rather, it requires prices to emerge without fraud, monopoly, artificial scarcity, or exploitation. The prohibition of *ihtikar* supports intervention against hoarding of essential goods, while the avoidance of excessive *gharar* emphasizes transparent information and reduced uncertainty in transactions. The principles of *maslahah* and *hifz al-mal* justify policies that protect consumers' purchasing power and producers' livelihoods, especially when extreme volatility threatens access to basic necessities (Alim & Marasabessy, 2023; Quddus & Widiastuti, 2022). A contemporary *al-Hisbah*-inspired framework may therefore include market supervision, accurate weights and measures, price disclosure, anti-manipulation enforcement, and accountable public intervention designed to balance producer incentives with consumer protection.

Existing literature provides important but fragmented evidence. Studies have examined determinants of chili and shallot prices, the contribution of strategic food commodities to inflation, and the risks faced by producers and consumers (Siagian et al., 2023; Sutisna et al., 2023; Swastika et al., 2022; Yuditya et al., 2023). Other research shows that cayenne pepper may exert a stronger inflationary effect than shallots because of its high consumption intensity, limited substitutability, greater volatility, and rapid pass-through to household and food-service prices (Hafied et al., 2022; Kusnadi & Shofwan, 2017; Lestari et al., 2024; Saputri et al., 2022). Nevertheless, most studies remain descriptive, rely heavily on local sources, or examine only one segment of the transmission process. City-level evidence linking commodity-specific prices, inflation, and regional economic growth remains limited, particularly in the post-pandemic period (Brahmana et al., 2022; I. A. Rahman et al., 2024; Salam et al., 2021; Syafitri et al., 2022). Moreover, few studies integrate conventional economic explanations with Islamic principles of market justice, welfare protection, anti-hoarding governance, and balanced producer-consumer interests.

This study therefore aims to analyze fluctuations in cayenne pepper and shallot prices and examine their relationship with inflation and economic growth in Palopo City during 2021–2025. It specifically investigates the patterns and determinants of price changes, evaluates their inflationary implications, and assesses whether cayenne pepper prices, shallot prices, and inflation jointly influence regional economic growth. The study hypothesizes that these variables collectively affect growth through purchasing-power, consumption, producer-income, and investment channels. Its novelty is primarily contextual and integrative: it focuses on a post-pandemic Indonesian city, combines two strategic horticultural commodities with inflation and regional growth in one framework, and interprets price stabilization through both regional economics and Islamic market ethics. The scope is limited to Palopo City and the available observation period; therefore, the findings are intended as locally grounded evidence rather than definitive long-run causal estimates.

LITERATURE REVIEW

Agricultural Commodity Price Volatility

Price volatility in agricultural commodities reflects the interaction between supply, demand, production risk, market structure, and institutional conditions. In basic price theory, market prices adjust when available supply does not correspond with consumer demand. This adjustment is especially pronounced for perishable horticultural products such as cayenne pepper and shallots because they have short storage lives, seasonal production cycles, and limited opportunities for immediate supply expansion (Dessy et al., 2022; Hilmiyah & Supriono, 2022; Hinlo & Lee, 2026; Indriani et al., 2020; Pan & Zheng, 2023). Price volatility therefore differs from ordinary price variation because it involves repeated and sometimes unpredictable movements that create uncertainty for producers, traders, consumers, and policymakers. In developing economies, such instability may be intensified by fragmented markets, weak storage systems, limited access to information, and uneven distribution infrastructure, which increase the sensitivity of retail prices to localized production and logistics disruptions.

Empirical studies identify climate, harvest seasons, pests, input availability, and production costs as central determinants of horticultural prices. Amin & Prihantini (2021) show that chili production and price movements in South Sulawesi are closely associated with seasonal conditions and production risk. Swastika et al. (2022) similarly find that supply levels, consumer demand, and trader purchasing prices significantly influence cayenne pepper price fluctuations, although climatic conditions do not always produce statistically significant effects in every setting. Rahmat et al. (2024) emphasize the importance of supply and demand in explaining cayenne pepper prices in Polewali Mandar Regency. These studies suggest that weather and biological risks matter primarily through their effects on output, while market demand and trader behavior determine how supply disturbances are transmitted into consumer prices.

Recent international literature broadens this explanation by emphasizing the combined effects of climate shocks, input-cost inflation, logistics disruptions, and policy



responses. Extreme rainfall, drought, and temperature anomalies can reduce yields, delay harvesting, and damage product quality, thereby increasing scarcity and price variability (Odongo et al., 2022; Zhou & Chen, 2023). Rising fertilizer, seed, fuel, and transportation costs also generate cost pressures that may be transferred along the marketing chain. Post-pandemic supply disruptions further demonstrated that perishable commodities are vulnerable to road restrictions, port congestion, labor shortages, and delayed distribution (Jagtap et al., 2024). Consequently, horticultural price volatility should be understood as a multidimensional phenomenon in which production shocks, cost structures, seasonal demand, and institutional capacity interact rather than operate independently.

Price Transmission and Food Inflation

Commodity-price pass-through provides the primary theoretical mechanism linking agricultural prices with inflation. Price changes move through the production and distribution chain from farmers to collectors, wholesalers, retailers, food-service businesses, and final consumers. The strength of pass-through depends on market competition, transportation costs, storage capacity, bargaining power, and the share of each commodity in the consumer price index. Previous studies demonstrate that commodity-price transmission differs across stages of the pricing chain and is often stronger at the producer level than at the consumer level (Onegina et al., 2022; M. C. Rahman et al., 2022; Rezitis & Pachis, 2020). However, in economies where food constitutes a large proportion of household expenditure, commodity-specific shocks may still generate substantial movements in food inflation and contribute to broader consumer-price instability (Adjemian et al., 2024; Peersman, 2022).

Evidence from Indonesia confirms that food-price transmission is an important source of inflationary pressure. Ibrahim & Nghiem (2025) report that commodity prices significantly affect consumer and food-price inflation, particularly under high-inflation conditions. Hafied et al. (2022) find that fluctuations in strategic food commodities, including cayenne pepper and shallots, positively and significantly affect inflation in Makassar City. Kusnadi & Shofwan (2017) similarly show that these commodities influence inflation in the short run, with cayenne pepper producing a more persistent effect. The stronger impact of cayenne pepper may reflect its high consumption intensity, limited substitutability, frequent use in household and restaurant meals, and greater price volatility. These characteristics increase the likelihood that a supply shock will be transmitted rapidly into local food prices.

The relationship between food prices and inflation is also consistent with cost-push inflation theory. When production, transportation, or distribution costs rise, businesses pass a portion of those increases to consumers. Persistent food-price shocks may then influence inflation expectations, wage demands, and price-setting behavior beyond the affected commodities. Eichengreen & Gupta (2024) argue that monetary-policy credibility and institutional arrangements determine whether temporary food shocks remain contained or produce broader second-round effects. Nevertheless, the magnitude of transmission is context-specific. Regions with diversified sources,

effective stock management, and competitive distribution networks may experience weaker pass-through, whereas areas with concentrated supply chains and high dependence on a few commodities may face stronger inflationary responses ([Ibrahim & Nghiem, 2025](#); [Liao et al., 2025](#)).

Household Consumption, Producer Income, and Regional Growth

Household consumption theory explains how food-price increases affect regional economic activity through real-income and expenditure channels. Lower-income households generally allocate a larger proportion of income to food, making them more vulnerable to increases in essential commodity prices ([Can et al., 2025](#); [Hafizah et al., 2020](#); [Mehare et al., 2025](#); [Nzayiramy et al., 2025](#)). When cayenne pepper, shallots, and other frequently consumed foods become more expensive, households may reduce consumption quantities, substitute cheaper products, or cut expenditure on education, transportation, services, and durable goods. [Headey et al. \(2024\)](#) emphasize that food-price changes generate heterogeneous welfare effects because household exposure depends on income, consumption patterns, and access to alternative products. Therefore, the inflationary consequences of food-price volatility may extend beyond the food sector by weakening broader household demand and reducing regional consumption growth.

The producer-income channel produces a more complex outcome. Higher commodity prices can increase farmers' gross revenues and provide incentives for expanded planting, greater input use, and investment in productivity. [Headey & Hirvonen \(2023\)](#) argue that rising food prices may reduce poverty and stimulate agricultural production under conditions where poor households are net producers and have sufficient access to land, credit, inputs, and markets. Conversely, farmers do not necessarily benefit from high retail prices when production has declined, input costs have risen, or intermediaries capture most of the price margin. Price collapses also expose producers to income losses, discourage future planting, and constrain investment. [Sutisna et al. \(2023\)](#) consequently identify substantial risks for both producers and consumers arising from agricultural price instability.

Regional growth theory integrates these household and producer effects through consumption, investment, employment, and sectoral linkages. Food-price increases may reduce economic growth when inflation weakens purchasing power and suppresses demand for nonfood goods and services ([Demeke & Tenaw, 2021](#); [Idisi, 2021](#)). Yet they may support growth when higher farm income stimulates production, employment, processing, logistics, and local investment. [Liao et al. \(2025\)](#) demonstrate that international food-price shocks influence output through consumption and investment channels, although their magnitude depends on economic structure and policy responses. In Palopo City, this relationship is particularly relevant because household consumption contributes substantially to regional expenditure, while trade and agricultural value chains support local economic activity. The net growth effect therefore depends on whether producer gains exceed consumer welfare losses and whether inflation remains controlled.



Price Stabilization, Supply Chains, and Empirical Approaches

The literature recommends combining short-term price stabilization with medium- and long-term improvements in production and distribution. Short-term measures include market operations, strategic stock releases, temporary subsidies, and targeted transfers to vulnerable households. Longer-term measures include cold storage, transport infrastructure, scheduled planting, crop diversification, climate-resilient farming, and stronger farmer organizations. Digital price-information systems can reduce information asymmetry by providing real-time data on prices, stocks, and expected shortages. [A. W. Putra et al. \(2021\)](#) and [Rifin et al. \(2023\)](#) emphasize that farmer cooperatives, shorter marketing channels, transparent price formation, and improved bargaining power can reduce excessive margins and stabilize producer returns. Effective interventions must nevertheless remain transparent, targeted, and time-bound to avoid fiscal burdens, black markets, or weakened production incentives.

Methodological literature indicates that the choice of econometric technique must correspond to data frequency, observation length, integration properties, and research objectives. Multiple regression is useful for estimating partial associations, but it is vulnerable to endogeneity, omitted-variable bias, autocorrelation, heteroskedasticity, and non-stationarity. Autoregressive distributed lag models can estimate short- and long-run relationships in relatively small samples containing variables integrated at different orders. Vector autoregression and vector error correction models are more suitable for examining dynamic feedback, impulse responses, cointegration, and transmission mechanisms, while Granger causality assesses predictive direction rather than structural causation. [Jiménez-Rodríguez & Morales-Zumaquero \(2022\)](#) and [Tenriawaru et al. \(2023\)](#) demonstrate the value of dynamic models for analyzing inflation and food-price relationships, although these approaches require sufficiently long and reliable time series.

Islamic Economic Perspectives on Food Markets

Islamic economics evaluates market outcomes through efficiency, justice, transparency, and public welfare. Market prices are generally permitted to emerge through legitimate supply and demand, but market freedom is constrained by the prohibition of fraud, monopoly, manipulation, and harm. Fair pricing does not imply that every commodity must have a fixed administrative price; rather, it requires that prices reflect actual scarcity and production conditions without exploitation. The principle of *maslahah* supports public action when severe food-price instability threatens social welfare, while *hifz al-mal* requires protection of both consumer purchasing power and producer wealth ([Abdillah et al., 2023](#); [Adada, 2019](#); [Ahmad, 2019](#); [Fikri, 2021](#)). [Alim & Marasabessy \(2023\)](#) and [Quddus & Widiastuti \(2022\)](#) emphasize that public policy should preserve equitable access to essential goods while maintaining legitimate incentives for production and exchange.

Islamic market governance also prohibits *ihtikar*, particularly when hoarding essential goods creates artificial scarcity and harms consumers. Excessive *gharar* and speculative manipulation are discouraged because they increase uncertainty and

allow unjust enrichment. The classical institution of al-Hisbah provides a normative foundation for modern market supervision through price transparency, accurate weights and measures, quality control, competition oversight, and anti-hoarding enforcement (Nurfaizah, 2020; Olushola, 2024; Uddin, 2023). Consumer protection must nevertheless be balanced with producer welfare because excessively low administered prices may discourage production and undermine long-term food security. From this perspective, stabilization should promote distributive justice and balanced welfare rather than favoring one group. Appropriate instruments may include transparent stock management, fair contracting, farmer cooperatives, targeted assistance, and accountable intervention consistent with maqasid al-Shariah.

Research Gap and the Significance of the Study

Existing studies provide substantial evidence on the determinants of agricultural prices and the effects of strategic food commodities on inflation. However, the literature remains fragmented. Many studies focus only on production factors, supply and demand, or the relationship between commodity prices and inflation. Others examine welfare or macroeconomic outcomes using national-level data that may conceal important subnational differences. City-level studies rarely integrate commodity-specific price fluctuations, inflation, and regional economic growth within a single analytical framework. Moreover, local studies are frequently descriptive, rely on short datasets, and provide limited discussion of transmission channels, methodological constraints, and indirect effects through household consumption, producer income, and investment.

The present study is significant because it examines cayenne pepper prices, shallot prices, inflation, and economic growth together within the specific post-pandemic context of Palopo City. Its contribution is primarily contextual and integrative rather than methodological. The study connects local commodity-price movements with inflation transmission and regional growth while identifying implications for consumers, farmers, traders, and local government. It also extends conventional analysis by incorporating Islamic economic principles of *maslahah*, *hifz al-mal*, fair pricing, market supervision, and the prevention of *ihtikar*. Although the limited observation period restricts strong causal inference, the study provides locally grounded evidence that can support more detailed future research using longer, higher-frequency datasets and dynamic econometric methods.

METHOD

Research Design

This study employed a quantitative research design to examine the relationship among cayenne pepper prices, shallot prices, inflation, and economic growth in Palopo City. The design was explanatory because it sought not only to describe price movements but also to assess whether changes in the selected variables were statistically associated with regional economic growth. The analysis focused on the 2021–2025 period, which represents the post-pandemic phase of local economic recovery and



includes several episodes of commodity-price instability. Although the original study referred to the approach as field research, the empirical analysis relied primarily on secondary data rather than direct observations of market participants. Accordingly, the research is more accurately classified as a quantitative secondary-data study with a regional time-series orientation. This clarification ensures consistency between the research design, the nature of the data, and the analytical procedures applied.

Study Area and Unit of Analysis

The study was conducted in Palopo City, South Sulawesi, Indonesia. Palopo was selected because cayenne pepper and shallots are widely consumed strategic food commodities whose price movements may influence local inflation and household expenditure. The city also provides an appropriate setting for examining the relationship between food-price instability and regional economic performance because household consumption, wholesale and retail trade, and food-related activities contribute substantially to its economy. The unit of analysis was annual regional economic data for Palopo City covering five consecutive years, from 2021 to 2025. Each annual observation represented the average market conditions for the variables included in the model. The study therefore did not use individual consumers, traders, or farmers as observation units. Instead, it analyzed aggregated regional indicators to identify broad patterns in commodity prices, inflation, and economic growth within the defined geographical and temporal scope.

Population, Sample, and Observation Period

The research population comprised all economic records associated with cayenne pepper prices, shallot prices, inflation, commodity production, harvested area, and regional economic growth in Palopo City. The sample consisted of annual observations available for the 2021–2025 period. These observations included the average retail prices of cayenne pepper and shallots, annual inflation rates, and indicators of regional economic growth based on Palopo City's Gross Regional Domestic Product. Production and harvested-area data were also reviewed to provide contextual explanations for observed price changes. The use of complete annual data for the selected period constituted a saturated sampling approach within the available dataset. However, the resulting sample contained only five time points. This limited number of observations restricts the statistical power of the regression estimates and prevents strong long-term or causal conclusions. The findings should therefore be interpreted as exploratory regional evidence rather than definitive time-series estimates.

Data Sources and Collection Procedures

The study used secondary quantitative data collected from official government institutions. Commodity-price data were obtained from the Palopo City Food Security Service and other official food-price information sources. Inflation, Gross Regional Domestic Product, and regional economic-growth data were drawn from publications of Statistics Indonesia and its Palopo City office. Supporting information on agricultural production, harvested area, and commodity availability was obtained from relevant

agricultural and food-security agencies. Data collection involved identifying the required indicators, reviewing the consistency of annual records, and organizing them into a comparable time-series dataset. The average annual price of each commodity was expressed in Indonesian rupiah per kilogram, inflation was measured as an annual percentage, and economic growth was measured using the annual growth rate of regional output. Data from different institutions were cross-checked where possible to minimize inconsistencies in definitions, reporting periods, and measurement units.

Variables and Operational Definitions

The dependent variable was regional economic growth in Palopo City, represented by the annual percentage change in Gross Regional Domestic Product. Three independent variables were included. The first variable was the average annual price of cayenne pepper, measured in Indonesian rupiah per kilogram. The second variable was the average annual price of shallots, also measured in Indonesian rupiah per kilogram. The third variable was the annual inflation rate in Palopo City, expressed as a percentage. Commodity-price changes were interpreted as indicators of volatility in strategic food markets, while inflation represented the broader transmission of price pressures to consumer expenditure. Economic growth captured the annual expansion or contraction of regional economic activity. Production levels, harvested area, harvest seasons, extreme weather, distribution constraints, and festive-period demand were not included as formal regressors, but they were used as contextual factors to interpret commodity-price movements and their possible economic consequences.

Data Analysis

The analysis was conducted in two stages. First, descriptive analysis was used to identify annual trends in cayenne pepper prices, shallot prices, inflation, and regional economic growth. Percentage changes were calculated to show the magnitude and direction of price movements between years. These patterns were then compared with production, distribution, weather, and seasonal-demand conditions discussed in the supporting data and literature. Second, multiple linear regression was used to estimate the simultaneous relationship between the independent variables and economic growth. The general model was specified as economic growth as a function of cayenne pepper prices, shallot prices, and inflation. The overall significance of the model was assessed using the F-test at a 5 percent significance level. The null hypothesis stated that the three independent variables had no simultaneous relationship with economic growth, whereas the alternative hypothesis stated that they jointly had a statistically significant relationship.

Model Evaluation and Methodological Limitations

For a time-series regression to produce reliable estimates, several diagnostic requirements should be considered, including normality, multicollinearity, heteroskedasticity, autocorrelation, and stationarity. These procedures are important because trending or serially correlated data may generate misleading significance levels and unstable coefficients. However, the very small number of annual

observations substantially limits the feasibility and reliability of such tests in the present study. The regression results must therefore be interpreted with considerable caution, especially because economic growth is also influenced by household consumption, investment, government expenditure, labor, population, and other omitted factors. The model identifies statistical association rather than structural causality. Future studies should employ monthly or quarterly data over a longer period and consider dynamic methods such as autoregressive distributed lag, vector autoregression, vector error correction, or Granger causality analysis to distinguish short-run effects, long-run relationships, and possible mediation through inflation.

RESULTS

Price Movements of Cayenne Pepper and Shallots

The prices of cayenne pepper and shallots in Palopo City fluctuated substantially during 2021–2025, although both commodities displayed an overall upward tendency across the observation period. Cayenne pepper prices increased from IDR 46,990 per kilogram in 2021 to IDR 52,583 in 2022, representing an annual increase of 11.88 percent. The price subsequently declined to IDR 48,177 in 2023 before rising again to IDR 53,542 in 2024. The largest increase occurred in 2025, when the average price reached IDR 68,571 per kilogram, or 28.11 percent above the previous year. This pattern indicates that cayenne pepper prices were not only volatile but also increasingly exposed to sharp upward adjustments, particularly toward the end of the study period. The observed movements are consistent with the sensitivity of horticultural commodities to supply disruptions, harvest timing, distribution constraints, and seasonal demand.

Table 1

Average Price and Annual Change of Cayenne Pepper in Palopo City

Year	Price (IDR/kg)	Annual change
2021	46,990	–
2022	52,583	11.88%
2023	48,177	–8.37%
2024	53,542	11.15%
2025	68,571	28.11%

Source: Secondary data. Authors' compilation.

Shallot prices followed a different pattern. The average price rose moderately from IDR 36,097 per kilogram in 2021 to IDR 38,188 in 2022. In 2023, however, the price fell sharply to IDR 30,451, representing a decline of 20.24 percent. The downward movement was temporary because shallot prices recovered to IDR 36,875 in 2024 and reached IDR 39,821 in 2025. The 2023 decline constituted the most prominent anomaly in the series and may indicate a temporary increase in supply, favorable harvest conditions, weaker demand, or improved distribution. The subsequent recovery suggests that the decline did not represent a permanent structural change. Compared with cayenne pepper, shallot prices experienced a deeper single-year decrease but a more moderate

cumulative increase across the full observation period. These findings correspond with evidence that shallot prices fluctuate but may remain relatively stable over longer horizons.

Table 2

Average Price and Annual Change of Shallots in Palopo City

Year	Price (IDR/kg)	Annual change
2021	36,097	–
2022	38,188	5.79%
2023	30,451	–20.24%
2024	36,875	21.11%
2025	39,821	8.01%

Source: Secondary data. Authors' compilation.

Factors Associated with Commodity Price Fluctuations

Field information and supporting regional data indicate that several interconnected factors were associated with the observed price movements. Production-related factors included heavy rainfall, drought, pest attacks, production delays, and variations in access to seeds and fertilizers. These factors affected output volume and the timing of market supply. Distribution and logistics also played an important role because dependence on supplies from outside Palopo City exposed local markets to transport delays, road conditions, and higher delivery costs. Seasonal demand contributed to temporary price increases during Ramadan, Eid al-Fitr, Christmas, New Year, and other periods of intensified household consumption.

Government policy and broader external conditions were also relevant to commodity-price instability. Delays in fertilizer subsidies, limited stabilization reserves, the absence of clearly defined reference prices, and insufficient coordination among producers, traders, and local agencies may increase exposure to market shocks. Exchange-rate changes can raise the cost of imported production inputs, while pandemics and geopolitical disruptions may affect national and regional supply chains. The 2025 cayenne pepper price surge appears consistent with a combination of constrained supply and strong demand, although the available annual data do not permit the independent effect of each determinant to be measured statistically.

Inflation Dynamics and Commodity-Price Movements

Inflation in Palopo City varied considerably during the same period. The annual rate was 2.96 percent in 2021 and increased sharply to 5.13 percent in 2022, the highest value recorded during the study period. Inflation then declined to 2.21 percent in 2023 and fell further to 1.87 percent in 2024. In 2025, it increased moderately to 2.75 percent. The inflation pattern did not move identically with the price of either commodity in every year, but several parallel movements were evident. The 2022 increase in cayenne pepper prices occurred alongside the highest inflation rate, whereas the substantial decline in shallot prices in 2023 coincided with a marked reduction in inflation. The

increase in inflation in 2025 also occurred during the largest cayenne pepper price surge, although inflation remained considerably below the 2022 level.

Table 3

Inflation in Palopo City, 2021–2025

Year	Inflation rate	General condition
2021	2.96%	Relatively low and stable
2022	5.13%	Highest rate during the period
2023	2.21%	Substantial decline
2024	1.87%	Inflation relatively controlled
2025	2.75%	Moderate increase

Source: Secondary data. Authors' compilation.

The descriptive comparison suggests that cayenne pepper prices were more closely aligned with short-term inflationary movements than shallot prices. Cayenne pepper is frequently consumed, highly perishable, and difficult to substitute completely in local household and food-service consumption. Its price changes may therefore be transmitted rapidly into the food component of the consumer price index. Shallots also contributed to volatile-food dynamics, but their influence appeared less consistent. The sharp fall in shallot prices in 2023 may have helped reduce inflationary pressure, although other food and nonfood components also influenced the overall inflation rate.

Simultaneous Relationship with Regional Economic Growth

The multiple regression analysis examined whether cayenne pepper prices, shallot prices, and inflation were simultaneously associated with economic growth in Palopo City. The model produced an F-statistic of 19.201, which exceeded the reported critical F-value of 5.409. The significance probability was 0.002, below the 0.05 threshold. On this basis, the null hypothesis stating that the three independent variables had no joint relationship with economic growth was rejected, while the alternative hypothesis was accepted. The result indicates that the selected variables collectively explained statistically significant variation in the economic-growth indicator within the available dataset. However, the result refers only to the simultaneous significance of the model. It does not independently establish the magnitude, direction, or statistical significance of each coefficient because complete partial regression results were not reported in the original dataset.

The statistical finding is consistent with the observed economic channels linking food prices, inflation, and regional activity. Rising commodity prices can reduce household purchasing power and redirect expenditure toward essential food, thereby limiting demand for other goods and services. Inflation may reinforce this effect by reducing real income and increasing uncertainty in consumption and investment decisions. At the same time, higher agricultural prices may increase producer revenue when supply remains available, potentially supporting production and local trade. Nevertheless, the limited number of annual observations means that the regression result should be interpreted as an exploratory association. It does not confirm a stable

long-run relationship or a causal transmission mechanism between commodity prices and economic growth.

Price Stabilization Measures Identified from the Findings

The results indicate that price management in Palopo City requires coordinated measures addressing both supply instability and market transmission. The most relevant measures include strengthening partnerships among farmers, traders, distributors, and government agencies; shortening distribution chains; and improving transport and storage facilities. Market operations and strategic food reserves may be used during severe price increases, particularly when shortages coincide with religious holidays or adverse weather. A digital price-information system could improve transparency by providing real-time information on market prices, stocks, and expected supply gaps. Production-oriented measures include scheduled planting, crop diversification, improved agricultural technology, and training to increase resilience against climate and pest risks. The findings also support developing farmer groups or cooperatives to strengthen bargaining power and improve coordination between production and marketing activities.

The identified policy measures correspond with the observed characteristics of the two commodities. Cayenne pepper requires particularly close monitoring because of its high volatility and stronger apparent relationship with inflation, whereas shallot management should focus on preventing both excess supply and sudden shortages. Reference prices, if adopted, should be transparent and sufficiently flexible to preserve production incentives. Local policy should therefore combine short-term interventions, such as market operations, with medium-term improvements in production and distribution and long-term investments in information and institutional capacity. The present results consequently support a multisectoral approach involving local government, farmers, traders, distributors, and consumers, while recognizing that more extensive data are required to evaluate the effectiveness of each intervention.

DISCUSSION

Commodity Price Volatility and Its Determinants

The findings show that cayenne pepper and shallot prices in Palopo City followed distinct but related patterns during 2021–2025. Cayenne pepper prices displayed a generally upward trajectory, with the sharpest increase occurring in 2025, while shallot prices were more irregular and declined markedly in 2023 before recovering. These movements indicate that horticultural prices in Palopo are shaped by unstable supply, seasonal demand, production risk, and distribution constraints. The stronger volatility of cayenne pepper is consistent with its perishability, limited storage capacity, and sensitivity to short-term shortages. By contrast, shallot prices appear more responsive to changes in harvest volume and temporary oversupply, suggesting that each commodity requires a differentiated explanation rather than a uniform interpretation.

These findings are broadly consistent with earlier Indonesian studies. [Amin & Prihantini \(2021\)](#) emphasize that chili production and prices are strongly influenced by



harvest conditions and production risk, while [Swastika et al. \(2022\)](#) identify supply, consumer demand, and trader purchasing prices as significant determinants of cayenne pepper fluctuations. [Rahmat et al. \(2024\)](#) similarly demonstrate the importance of supply and demand in shaping prices in Polewali Mandar Regency. The shallot price decline observed in 2023 also corresponds with previous findings that production volume, harvested area, input costs, and competition from substitute products affect shallot prices ([Faradila G. et al., 2022](#); [Febrayanto et al., 2024](#); [Subagio et al., 2023](#); [Wibowo & Surbakti, 2023](#)). International evidence further supports the role of climate shocks, logistics disruptions, and post-pandemic supply-chain instability in horticultural markets ([Abatcha, 2021](#); [Agboola et al., 2022](#); [Ali et al., 2019](#); [Jagtap et al., 2024](#); [Odongo et al., 2022](#)).

Theoretically, the results reinforce supply-and-demand theory by showing that prices respond rapidly when short-run supply cannot adjust to changing demand. They also demonstrate that agricultural price formation should be interpreted through market structure, production uncertainty, and distribution efficiency rather than through quantity alone. Practically, local authorities should develop commodity-specific strategies. Cayenne pepper requires rapid monitoring, diversified sourcing, and short-term supply intervention, whereas shallot management should focus on planting coordination and prevention of oversupply. Policy should therefore integrate weather information, harvest calendars, stock monitoring, and transport conditions into an early-warning system. A uniform stabilization policy would be less effective because the two commodities differ in storage characteristics, market responses, and volatility patterns.

Food Prices and Inflation Transmission

The results indicate that cayenne pepper prices were more closely aligned with inflation movements than shallot prices. Inflation rose sharply in 2022 when cayenne pepper prices increased and rose again in 2025 when cayenne pepper experienced its largest annual surge. By contrast, the substantial decline in shallot prices in 2023 coincided with lower inflation, although the movement of inflation cannot be attributed to one commodity alone. These patterns suggest that cayenne pepper functions as a more influential volatile-food component in Palopo City. Its frequent consumption, limited substitutability, and widespread use in household and food-service activities may accelerate the transmission of price changes into the consumer price index and reinforce short-term inflationary pressure.

This interpretation is supported by [Hafied et al. \(2022\)](#), who find that fluctuations in cayenne pepper and shallot prices positively and significantly affect inflation in Makassar City. [Kusnadi & Shofwan \(2017\)](#) also report that both commodities influence inflation in the short term, while cayenne pepper produces a stronger and more persistent effect. [Ibrahim & Nghiem \(2025\)](#) provide broader evidence that commodity-price pass-through to consumer and food inflation in Indonesia becomes more pronounced under high-inflation conditions. Nevertheless, [Jiménez-Rodríguez & Morales-Zumaquero \(2022\)](#) caution that pass-through varies across pricing stages

and is not always complete. This implies that Palopo's inflation response may also depend on retail competition, distribution margins, substitution behavior, and policy intervention.

Theoretically, these findings support cost-push inflation and commodity-price pass-through frameworks. A supply disruption raises farmgate and wholesale prices, which are transmitted through transport, retail, and food-service costs to consumers. Practically, inflation control should not rely solely on aggregate monitoring because commodity-specific shocks can generate disproportionate local effects. Local government should prioritize high-frequency monitoring of cayenne pepper stocks, prices, and distribution flows, especially before religious holidays and during adverse weather. Policy interventions should include temporary market operations, improved supply coordination, and transparent price information. However, price controls must remain limited and carefully designed because suppressing producer prices without supply support may discourage production and intensify future shortages.

Commodity Prices, Purchasing Power, and Regional Growth

The regression results show that cayenne pepper prices, shallot prices, and inflation jointly had a statistically significant association with economic growth in Palopo City. This finding suggests that strategic food prices influence regional performance through several interconnected channels. When food prices rise, households allocate a larger share of income to essential consumption and reduce expenditure on nonfood goods and services. Inflation further weakens real income and may delay consumption and investment decisions. At the same time, higher agricultural prices can improve producer revenue when output remains stable. The overall growth effect therefore reflects the balance between consumer welfare losses, producer income gains, and changes in trade, services, employment, and investment across the regional economy.

The finding is consistent with [Headey et al. \(2024\)](#), who show that food-price shocks produce heterogeneous welfare effects because low-income households devote a larger share of expenditure to food. [Headey & Hirvonen \(2023\)](#) nevertheless argue that higher food prices may stimulate agricultural output and reduce poverty where poor households are net producers with access to markets and productive resources. [Liao et al. \(2025\)](#) similarly demonstrate that food-price shocks affect macroeconomic activity through consumption and investment channels. The Palopo evidence therefore supports a conditional interpretation rather than an exclusively negative one. Rising prices may benefit producers, but such gains may be limited when input costs increase, output falls, or intermediaries capture substantial marketing margins, as also suggested by [Sutisna et al. \(2023\)](#).

Theoretically, the results connect household consumption theory with regional growth theory. Food-price volatility affects aggregate demand through purchasing power, while producer responses influence supply, employment, and investment. Practically, policy should protect consumers without eliminating incentives for farmers. Targeted transfers, affordable food programs, and temporary market operations can support vulnerable households, while input assistance, storage investment, and fair



marketing arrangements can protect producers. From a regional development perspective, diversification of agricultural supply and expansion of processing and logistics activities may convert price signals into productive investment. However, because the study uses only five annual observations, the significant regression result should be interpreted as exploratory association rather than definitive evidence of causality or long-run equilibrium.

Price Stabilization, Market Governance, and Islamic Economics

The study identifies supply-chain improvement, market operations, digital price information, production planning, and institutional coordination as the principal strategies for managing food-price volatility. These measures correspond directly with the observed sources of instability in Palopo City. Short distribution chains can reduce transport costs and excessive margins, while real-time information can limit uncertainty and improve decisions by farmers, traders, and consumers. Strategic reserves and temporary market operations can moderate exceptional price increases, particularly when weather shocks or festive demand disrupt supply. Farmer groups and cooperatives may also strengthen bargaining power and reduce dependence on dominant intermediaries. The findings therefore support a multilevel strategy combining immediate stabilization with longer-term investments in production, storage, logistics, and market institutions.

Earlier studies provide support for these recommendations. Previous studies emphasize farmer organization, shorter marketing channels, and transparent price formation as important mechanisms for improving market efficiency and producer welfare (Hamida et al., 2023; Mustofa et al., 2026; Nurhayati & Firmansyah, 2026; Rini et al., 2023). Other studies demonstrate that resilient storage and logistics systems reduce the impact of supply-chain disruptions on food markets (Burgos & Ivanov, 2021; Muzamil et al., 2024; Rojas-Reyes et al., 2024; Singh et al., 2021; Umar & Wilson, 2024). Hafied et al. (2022) also highlight market intervention, distributor partnerships, and price-information systems as relevant approaches to controlling strategic food prices. However, the literature warns that poorly designed subsidies and permanent price controls may generate fiscal pressure, discourage production, and create market distortions. Effective stabilization therefore requires clear objectives, transparent implementation, reliable data, and periodic evaluation.

From an Islamic economics perspective, the results are consistent with *maslahah*, *hifz al-mal*, distributive justice, and fair market governance. Stabilizing essential food prices protects consumer purchasing power while preserving producer livelihoods, thereby balancing welfare across market participants. The prohibition of *ihtikar* provides a normative basis for preventing hoarding and artificial scarcity, while the avoidance of excessive *gharar* supports transparent information and predictable transactions. *Al-Hisbah*-inspired oversight may be reflected in accurate price reporting, fair weights, quality control, and anti-manipulation enforcement (Altair, 2025; Fanani & Takayasa, 2022; Jaafar et al., 2021; Mohd Zawawi et al., 2025; Mujahidin et al., 2021; Triwibowo et al., 2022). Policy intervention is therefore justified when it prevents

harm and restores fairness, but it should not eliminate legitimate profit or suppress market incentives necessary for sustainable production.

CONCLUSION

This study shows that cayenne pepper and shallot prices in Palopo City experienced substantial fluctuations during 2021–2025, although the two commodities followed different patterns. Cayenne pepper prices exhibited a stronger upward tendency and reached their highest level in 2025, whereas shallot prices declined sharply in 2023 before recovering. These movements were associated with production conditions, weather disturbances, input availability, distribution constraints, seasonal demand, and government intervention. The inflation pattern indicates that cayenne pepper prices were more closely aligned with short-term inflationary movements than shallot prices, reflecting their high consumption intensity, limited substitutability, perishability, and rapid transmission through household and food-service expenditures.

The regression results indicate that cayenne pepper prices, shallot prices, and inflation were jointly associated with regional economic growth. This relationship operates through interconnected consumption, purchasing-power, producer-income, trade, and investment channels. Rising food prices may increase revenues for producers when output remains stable, but they can simultaneously weaken household purchasing power and reduce spending on nonfood goods and services. The findings therefore imply that regional policy should balance consumer protection with adequate producer incentives. Effective measures include improved production planning, shorter distribution chains, stronger logistics and storage systems, market operations during exceptional shortages, digital price information, and transparent cooperation among farmers, traders, distributors, and public institutions.

The study contributes to existing knowledge by integrating commodity-specific price movements, inflation transmission, and regional economic growth within a single city-level framework. Its contextual contribution is strengthened by the inclusion of Islamic economic principles, particularly *maslahah*, *hifz al-mal*, distributive justice, fair market governance, and the prevention of *ihtikar*. These principles support intervention when market instability threatens public welfare, provided that legitimate profit and production incentives are preserved. Although the findings should be interpreted cautiously because of the limited dataset, the study offers a locally grounded basis for regional price-stabilization policy and future comparative research using longer, higher-frequency data and more advanced dynamic econometric methods.

Limitations of the Study

The principal limitation of this study is the very small number of annual observations covering only 2021–2025. A five-year dataset is insufficient for establishing stable time-series relationships or drawing strong causal conclusions. It also limits the reliability of classical assumption tests, including stationarity, autocorrelation, heteroskedasticity, multicollinearity, and normality diagnostics. Consequently, the reported regression significance should be interpreted as exploratory evidence of association rather than

proof of a long-run or causal relationship. The annual frequency also conceals short-term price movements, seasonal spikes, harvest-cycle effects, and temporary policy interventions that may occur within a year and substantially influence commodity prices and inflation.

The model is also limited by its narrow specification. Regional economic growth is influenced by household consumption, investment, government expenditure, employment, population, production, climate conditions, market structure, and distribution efficiency, but these variables were not formally included. The study did not separately estimate the direct and indirect effects of commodity prices, particularly whether inflation mediates their relationship with economic growth. Moreover, the analysis relied primarily on aggregate secondary data and did not incorporate household, farmer, or trader-level evidence. As a result, differences in welfare effects, bargaining power, producer margins, and consumer vulnerability could not be measured directly. These constraints limit the generalizability of the findings beyond Palopo City.

Recommendations for Future Research

Future research should use longer observation periods and higher-frequency data, preferably monthly or quarterly series covering at least ten years. More extensive data would allow researchers to capture seasonal patterns, religious-holiday demand, climate shocks, supply disruptions, and policy interventions with greater precision. Dynamic methods such as autoregressive distributed lag models, vector autoregression, vector error correction models, structural vector autoregression, local projections, and Granger causality could then be applied to distinguish short-run responses from long-run relationships. Researchers should also test whether inflation serves as a mediating variable between commodity-price fluctuations and regional economic growth and examine possible feedback effects from growth to demand and prices.

Subsequent studies should broaden the model by including local production, harvested area, rainfall, fertilizer and fuel costs, transportation expenses, household consumption, investment, government expenditure, labor, and population. Comparative analysis across cities or regencies would help determine whether the Palopo findings reflect distinctive local conditions or wider regional patterns. Household and market surveys should also be incorporated to assess distributional effects on low-income consumers, farmers, traders, restaurants, and other economic actors. Finally, future research should operationalize Islamic economic principles through measurable indicators of price fairness, market transparency, producer welfare, consumer protection, and anti-hoarding enforcement, thereby strengthening the empirical connection between maqasid al-Shariah and regional food-price governance.

Author Contributions

Conceptualization	A., A.S.I., & I.	Resources	A., A.S.I., & I.
Data curation	A., A.S.I., & I.	Software	A., A.S.I., & I.
Formal analysis	A., A.S.I., & I.	Supervision	A., A.S.I., & I.

Funding acquisition	A., A.S.I., & I.	Validation	A., A.S.I., & I.
Investigation	A., A.S.I., & I.	Visualization	A., A.S.I., & I.
Methodology	A., A.S.I., & I.	Writing – original draft	A., A.S.I., & I.
Project administration	A., A.S.I., & I.	Writing – review & editing	A., A.S.I., & I.

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Informed Consent Statement

Informed consent was not required for this study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest

The authors declare no conflicts of interest.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the authors used DeepL and Grammarly to translate from Indonesian to American English, as well as to improve the clarity and readability of the article. They also used Turnitin to check the percentage of plagiarism in the manuscript.

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