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DO PUBLIC RICE DISTRIBUTION PROGRAMS STABILIZE FOOD MARKETS? EVIDENCE FROM SPHP RICE AND FOOD ASSISTANCE POLICIES IN URBAN INDONESIA

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ABSTRACT

Climate change conditions that disrupt rice supplies have become a critical challenge to food security, inflation management, and household welfare in urban Indonesia. In response, the government implemented Distribution of SPHP Rice and Rice Food Assistance as market intervention policy instruments. However, empirical evidence regarding their impact on price stability is still unclear. This study investigates the impact of these interventions on volatility of rice price, volatility of General Consumer Price Index, and volatility of Consumer Price Index for Expenditure Group 01 (Food, Beverages, and Tobacco) in Medan City, Indonesia. By analyzing the pre-intervention period using monthly time series data from 2019–2023, a lower volatility measure reflects a higher level of stability. Volatilities were measured by the Coefficient of Variation (CV), Corrected Coefficient of Variation (CCV), and Standard Deviation of Log Price Differences (SDD), complemented by paired sample statistical tests. The results show that the integration of SPHP Rice and Rice Food Assistance Distribution significantly reduces rice price volatility. The integration also reduces the volatility of the General CPI, The volatility of Consumer Price Index for Expenditure Group 01 (Food, Beverages, and Tobacco) Therefore, it can be concluded that food assistance programs can simultaneously strengthen social protection, inflation control, and food market stability through Dual-Track Food Market Stabilization Framework, which integrates the demand-side social protection such as the Distribution Rice Food Assistance with the supply-side market intervention such as the SPHP Rice Distribution.

Keywords: Food Market Stabilization, Food Security, Inflation Control, Rice Food Assistance, Rice Price Volatility, Social Protection

INTRODUCTION

Food price stability remains one of the most critical policy challenges facing developing countries, particularly those where staple foods constitute a substantial share of household expenditure. In Indonesia, rice occupies an important position not only as the primary staple food but also as a strategic commodity closely associated with poverty reduction, inflation control, social welfare, and political stability. Consequently, fluctuations in rice prices often generate broader economic and social consequences that extend beyond the agricultural sector. Rising rice prices can reduce household purchasing power, increase food insecurity among vulnerable populations, contribute to inflationary pressures, and potentially trigger social discontent, particularly in densely populated urban areas where households are highly dependent on market-based food access (Timmer, 2014; Dawe & Slayton, 2010).

The urgency of maintaining rice price stability has become increasingly evident in recent years. Indonesia experienced significant food inflation pressures during the post-pandemic recovery period, compounded by global supply chain disruptions, climate-related production uncertainties, and increasing production and distribution costs. Data from Statistics Indonesia indicate that rice has consistently contributed to inflationary pressures across major urban centers, including Medan, one of the largest metropolitan areas in western Indonesia. Unlike rural households that may partially rely on self-production, urban households depend almost entirely on market mechanisms for food procurement, making them particularly vulnerable to fluctuations in staple food prices. Under such circumstances, food market stabilization is no longer merely an agricultural policy concern but has become an essential component of social protection and economic resilience strategies (FAO, 2021; World Bank, 2022).

To mitigate the impact of rising food prices, the Indonesian government has implemented several interventions aimed at stabilizing rice markets and protecting vulnerable households. Among the most prominent are the Food Supply and Price Stabilization Program and Rice Food Assistance. The Food Supply and Price Stabilization Program seeks to increase rice availability in the market through controlled distribution channels, thereby reducing supply shortages and limiting speculative price increases. Meanwhile, Rice Food Assistance directly targets low-income households by providing rice transfers intended to maintain food access and reduce expenditure burdens. These interventions represent a significant public investment in food security governance and reflect the state's commitment to ensuring affordable food access during periods of market volatility. However, despite their extensive implementation, questions remain regarding the extent to which these programs effectively stabilize food markets rather than merely alleviate short-term consumption constraints.

Existing scholarship has provided important insights into the relationship between public food reserves, market interventions, and food price stabilization. Early studies emphasized the role of government-managed food stocks in reducing market uncertainty and buffering temporary supply shocks. Gilbert and Morgan (2010) argued that strategic grain reserves can mitigate excessive price volatility when market mechanisms alone fail to maintain equilibrium. Similarly, Timmer (2014) highlighted that public intervention remains necessary in rice-dependent economies because staple food markets often exhibit structural imperfections that prevent efficient self-correction during periods of crisis. These studies established a strong foundation for understanding the importance of state involvement in food market governance, particularly in developing countries where food security concerns are closely linked to social stability.

Subsequent research expanded the discussion by examining the effectiveness of food assistance programs as instruments of social protection. The literature generally suggests that food transfers contribute positively to household food security, nutritional outcomes, and poverty reduction. Studies conducted by Gentilini (2022), the Food and Agriculture Organization (2021), and the World Bank (2022) demonstrate that food assistance programs can protect vulnerable populations from adverse economic shocks by preserving access to

essential food commodities. Similar findings have been reported in several developing countries where food transfer schemes function as safety nets during periods of economic instability (Alderman et al., 2018; Barrett, 2020). Within this perspective, food assistance is primarily understood as a mechanism for enhancing household welfare rather than influencing broader market dynamics.

More recent scholarship has begun exploring the interaction between social protection policies and macroeconomic stability. Researchers increasingly recognize that food assistance programs may generate indirect market effects by altering consumption patterns and reducing pressure on commercial food markets. Studies by Handa et al. (2018) and Bastagli et al. (2019) suggest that targeted transfers can influence local market conditions through changes in aggregate demand. Likewise, the Organisation for Economic Co-operation and Development (2023) argues that social protection measures may contribute to inflation management when implemented alongside complementary market interventions. These findings have encouraged a more integrated understanding of food security policies that extends beyond traditional welfare-oriented frameworks.

The growing emphasis on food systems resilience has further stimulated interest in understanding how multiple policy instruments interact within complex food markets. Contemporary studies increasingly view food security as an outcome of interconnected processes involving production, distribution, consumption, and governance (Clapp et al., 2022; Barrett, 2021). Research conducted by the International Food Policy Research Institute (2024) indicates that coordinated interventions addressing both supply and demand dimensions are often more effective in enhancing market resilience than isolated policy measures. Nevertheless, empirical evidence regarding the combined effects of market stabilization programs and food assistance schemes remains relatively limited, particularly in urban settings characterized by high consumption intensity and strong dependence on market-based food access.

Despite these important advances, the existing body of knowledge continues to exhibit several limitations. Much of the literature evaluates food assistance primarily through indicators of household welfare, poverty reduction, or food consumption outcomes, while relatively little attention has been devoted to examining whether such interventions influence the stability of food markets themselves. Likewise, studies focusing on price stabilization policies frequently assess changes in average price levels without considering the broader dynamics of market volatility. As a result, the relationship between social protection instruments and market stabilization outcomes remains insufficiently understood. This limitation becomes particularly significant in contexts where governments simultaneously deploy supply-side interventions and demand-side assistance programs, creating policy interactions that cannot be adequately explained through conventional analytical frameworks.

Furthermore, methodological approaches used in previous studies often rely on standard inflation analysis, price trend assessment, or household-level impact evaluation. While these approaches provide valuable information, they may not fully capture the extent to which policy interventions influence the stability of market behavior over time. Evaluating

volatility dynamics offers a more comprehensive perspective because market stability is not solely reflected in lower prices but also in reduced fluctuations and greater predictability. Understanding these dynamics is especially important in urban food systems where households are highly sensitive to sudden price shocks.

Against this backdrop, this study advances the discussion by examining how public rice distribution programs operate simultaneously through market-oriented and social protection mechanisms to influence food market stability. Rather than treating price stabilization and food assistance as separate policy domains, the study explores their interconnected effects on rice price volatility, overall consumer price index volatility, and food-related inflation volatility in Medan City, Indonesia. By employing multiple volatility indicators and a before–after policy evaluation approach, the study offers a broader understanding of how coordinated public interventions shape urban food market dynamics. In doing so, it contributes to emerging debates on the integration of food security governance, social protection, and inflation management while providing empirical evidence from a developing-country context where food policy remains central to economic and social development. Accordingly, the study aims to analyze the extent to which the Food Supply and Price Stabilization Program and Rice Food Assistance influence rice market stability, overall inflation stability, and food inflation dynamics, thereby enhancing understanding of how public food distribution programs can support resilient and inclusive urban food systems.

RESEARCH METHOD

This study employed a quantitative descriptive approach combined with a before–after policy evaluation design to assess the effectiveness of public rice distribution programs in stabilizing food markets in urban Indonesia not only through perceptions or experiences of beneficiaries, but rather to examine measurable changes in rice price volatility and inflation dynamics before and after the implementation of government interventions. The study focused on identifying observable changes in market behavior through statistical indicators of volatility, thereby enabling an objective assessment of policy outcomes based on empirical evidence rather than subjective interpretations (Creswell & Creswell, 2018).

The research was conducted in Medan City, North Sumatra Province, Indonesia purposively based on its strategic importance within the regional food system and its status as the largest recipient of Food Supply and Price Stabilization Program rice and Rice Food Assistance distribution in North Sumatra. As one of Indonesia's major urban centers with large population, intensive rice consumption patterns, and significant role in regional trade networks, Medan exhibits high dependence on market-based food access and represents a suitable setting for examining the relationship between public food distribution policies and food market stability.

The study used secondary time-series data from Statistics Indonesia, the National Food Agency, and Perum BULOG. The dataset covered the period from January 2019 to December 2023 and consisted of monthly observations on rice prices, the General Consumer Price Index, the Consumer Price Index for the Food, Beverage, and Tobacco expenditure

group, realized distributions of Food Supply and Price Stabilization Program rice, and realized distributions of Rice Food Assistance. All datasets were cross-checked across institutional reports and compared with published statistical bulletins to ensure consistency in figures and reporting periods.

Market stability was measured through historical volatility analysis. Volatility was interpreted as the degree of fluctuation observed in prices and inflation indicators over time Following Gilbert and Morgan (2010). Three complementary measures were employed to capture different dimensions of volatility: the Coefficient of Variation (CV), the Corrected Coefficient of Variation (CCV), and the Standard Deviation of Log Price Differences (SDD). Lower volatility values indicate greater market stability, while higher values reflect stronger fluctuations and uncertainty. The volatilities were measured on multiple market indicators, including rice prices, the General Consumer Price Index, and the Consumer Price Index for Food, Beverage, and Tobacco.

The use of multiple volatility indicators was intended to improve analytical robustness and reduce potential bias associated with reliance on a single measurement approach. The analysis compared two policy periods. The pre-intervention period covered 2019–2022

The analysis compared two policy periods. The pre-intervention period covered 2019–2022, the intervention period 2023. Normality testing was performed using the Kolmogorov–Smirnov test. When data met the assumption of normality, differences between periods were examined using the paired-sample t-test. For variables that did not satisfy the normality assumption, the Wilcoxon signed-rank test was employed as a non-parametric alternative (Field, 2018).

RESULTS AND DISCUSSION

In 2023, Medan was recorded as one of the largest recipients of government food interventions in Indonesia. The total distribution of Food Supply and Price Stabilization Program (SPHP) rice reached 44,648,769 kilograms (BULOG Sumut, 2023). The rice was distribute in retail markets through traditional markets, modern retail outlets, and community food distribution networks. Through this mechanism, the government sought to strengthen the supply side of the rice market by ensuring the continuous availability of rice at affordable prices.

Complementing this market intervention, the government also implemented the Rice Food Assistance Program targeting low-income beneficiary households. During 2023, a total of 21,368,630 kilograms of rice were distributed through this scheme in Medan City. The program was implemented in two major phases, covering March–May and September–December 2023 (BULOG Sumut, 2023). Unlike SPHP rice, which was distributed through commercial channels, Rice Food Assistance functioned as a social protection instrument aimed at directly reducing household expenditure burdens and maintaining food access among vulnerable populations. By providing rice free of charge, the program potentially reduced household dependence on commercial rice markets, thereby easing demand pressures during periods of price instability.

Table 1 shows the normality test for 3 variable in question. Rice price data consistently exhibited non-normal distributions by significance values below the 0.05 threshold in all years. This finding suggests that rice price movements in Medan were characterized by asymmetric fluctuations and irregular variations that may reflect the influence of market shocks, seasonal factors, supply chain disruptions, and policy interventions. The persistence of non-normality in rice prices further indicates that price dynamics were not governed by stable linear trends but rather by complex market mechanisms that generated uneven patterns of change over time.

In contrast, the General Consumer Price Index demonstrated normal distribution characteristics throughout the entire observation period. All significance values exceeded the conventional 0.05 threshold, indicating that changes in overall consumer prices followed a relatively stable and predictable pattern. This finding is consistent with the nature of aggregate inflation indicators, which tend to smooth fluctuations occurring within individual commodity groups. The broader composition of the General CPI allows increases in some commodities to be offset by decreases in others, resulting in a more balanced distribution of price movements across time.

A slightly different pattern emerged for the Consumer Price Index of the Food, Beverage, and Tobacco expenditure group. While the 2019 data failed to meet the normality assumption, observations from 2020 to 2023 were normally distributed. This transition may indicate that food-related inflation became relatively more stable following the disruptions experienced in earlier periods. Nevertheless, the non-normal distribution observed in 2019 highlights the vulnerability of food-related expenditures to market shocks and changing supply conditions, particularly in urban food systems where staple commodities play a dominant role in household consumption. With these results, Rice Price were the analysed with The Wilcoxon Signed Rank Test, while General CPI and Group 1 CPI with The Paired Sample t-test.

Table 1. Results of the Kolmogorov–Smirnov Normality Test

Variable	Year	Mean	K–S Statistic	Sig.	Conclusion
Rice Price	2019	11.976,5	0,479	0,000	Non-Normal
	2020	11.548,4	0,334	0,001	Non-Normal
	2021	11.487,1	0,298	0,004	Non-Normal
	2022	11.510,8	0,348	0,000	Non-Normal
	2023	12.214,6	0,356	0,000	Non-Normal
General CPI	2019	142,38	0,144	0,200	Normal
	2020	103,04	0,213	0,137	Normal
	2021	104,75	0,150	0,200	Normal
	2022	109,50	0,236	0,063	Normal
	2023	113,29	0,144	0,200	Normal
Expenditure	2019	146,49	0,330	0,001	Non-Normal
Group 01 CPI (Food, Beverages, and Tobacco)	2020	102,59	0,170	0,200	Normal
	2021	105,43	0,142	0,200	Normal
	2022	112,31	0,227	0,090	Normal
	2023	116,75	0,167	0,200	Normal

Source: Processed SPSS 22 output (2026)

The Wilcoxon test results presented in Table 2 indicate that rice price volatility during 2023 differed significantly from the volatility observed in 2020–2022. The significance values obtained for the comparisons between 2023 and each of the years 2020, 2021, and 2022 were all below the 0.05 threshold, indicating statistically significant changes in rice price dynamics following the implementation of SPHP rice distribution and Rice Food Assistance. In contrast, the comparison between 2019 and 2023 did not reveal a statistically significant difference. These findings suggest that the policy interventions altered the pattern of rice price movements relative to most pre-intervention years, although the direction and magnitude of those changes require further examination through volatility indicators.

Table 2. Differences in Rice Price Volatility Before and During Policy Intervention

Comparison Period	Wilcoxon Statistic	Sig.	Conclusion
2019 vs. 2023	-1.820	0.069	Not Significant
2020 vs. 2023	-3.065	0.002	Significant
2021 vs. 2023	-3.071	0.002	Significant
2022 vs. 2023	-3.064	0.002	Significant

Source: Processed SPSS 22 output (2026)

Although statistically significant differences were observed, the descriptive analysis reveals a more nuanced pattern. Rice prices in Medan experienced persistent fluctuations throughout the 2019–2023 period. The lowest average price was recorded in October 2021 at IDR 11,444 per kilogram, whereas the highest average price occurred in September 2023 at IDR 12,917 per kilogram. Notably, 2023 was characterized not only by the highest rice price level during the observation period but also by substantially greater volatility. Based on annual CV values, the most stable market conditions occurred in 2021 with a volatility level of only 0.20%, while 2023 recorded the highest annual volatility at 2.76%. These results indicate that the implementation of SPHP rice distribution alone was insufficient to suppress rice prices or reduce overall market fluctuations.

This finding highlights the complexity of rice price formation in urban markets. Rice prices are influenced not only by retail supply conditions but also by broader structural factors, including production performance, transportation costs, interregional trade flows, expectations regarding future supply, and speculative market behavior. Consequently, increasing market supply through SPHP distribution may not automatically translate into lower prices or greater market stability when other determinants continue to exert upward pressure on prices. Similar observations have been reported in previous studies suggesting that government food reserves and market interventions are often more effective in mitigating short-term shortages than in fundamentally altering price trajectories (Gilbert & Morgan, 2010; Timmer, 2014).

To better understand the dynamics underlying these aggregate patterns, volatility was further examined across four intervention periods using CV, CCV, and SDD indicators. The results are presented in Table 3.

Table 3. Rice Price Volatility Measured by CV, CCV, and SDD

No	Year	P1 (%)			P2 (%)			P3 (%)			P4 (%)		
		CV	CCV	SDD	CV	CCV	SDD	CV	CCV	SDD	CV	CCV	SDD
1	2019	2.90	2.90	8.41	0.48	0.24	0.59	0.05	0.00	0.06	0.42	0.26	0.48
2	2020	0.80	0.80	3.96	1.69	0.84	2.06	0.32	0.01	0.02	0.16	0.15	0.31
3	2021	0.11	0.11	0.11	0.26	0.13	0.32	0.08	0.04	0.10	0.21	0.20	0.46
4	2022	0.12	0.12	0.32	0.18	0.09	0.44	0.15	0.15	0.36	0.45	0.45	0.79
5	2023	0.39	0.39	1.63	0.05	0.03	0.06	0.23	0.11	0.28	1.56	0.56	0.97

Source: Processed SPSS 22 output (2026)

During Period 1 and Period 3 of 2023, when SPHP rice was actively distributed through commercial channels, volatility levels remained higher than several pre-intervention periods. For example, the CV value in Period 1 of 2023 reached 0.39%, exceeding the corresponding values observed in 2021 (0.11%) and 2022 (0.12%). Likewise, volatility during Period 3 remained higher than several benchmark periods before policy implementation. These findings suggest that market-based rice distribution alone did not substantially improve price stability.

A markedly different pattern emerged during Period 2 (March–May 2023), when SPHP distribution was implemented simultaneously with the first phase of Rice Food Assistance. During this period, volatility reached its lowest level across the entire observation horizon, with CV, CCV, and SDD values of 0.05%, 0.03%, and 0.06%, respectively. Importantly, this stabilization occurred despite rice prices remaining substantially higher than those observed in previous years. In other words, the market did not experience lower prices, but it did experience greater price stability.

This distinction between price levels and price volatility is particularly important. While many policy evaluations focus primarily on reducing prices, market stabilization policies are fundamentally intended to reduce uncertainty and excessive fluctuations. A stable but relatively high price may generate less economic disruption than a lower but highly volatile price. The evidence from Medan indicates that the most stable market conditions occurred when SPHP distribution was accompanied by Rice Food Assistance rather than when SPHP was implemented independently.

During Period 2, BULOG distributed approximately 17.09 million kilograms of SPHP rice through retail markets and institutional distribution channels. Simultaneously, 9.10 million kilograms of rice were distributed free of charge to beneficiary households through the Rice Food Assistance Program. This combination appears to have influenced both sides of the market simultaneously. On the supply side, SPHP increased rice availability in commercial markets. On the demand side, food assistance reduced the need for low-income households to purchase rice from the market. As a result, market pressure was moderated through a dual mechanism that reduced both supply constraints and demand intensity.

These findings provide empirical support for the argument that food market

stabilization is most effective when market intervention policies are integrated with social protection measures. Rather than operating as separate policy domains, supply-side stabilization and demand-side assistance can reinforce one another in reducing market volatility. The Medan case demonstrates that social protection programs may contribute not only to household welfare but also to broader market stability by indirectly influencing consumption pressures. This result is consistent with recent international evidence suggesting that food assistance programs can function as complementary instruments for inflation management and food market resilience when implemented alongside market stabilization policies (OECD, 2023; IFPRI, 2024).

Beyond their role in influencing rice market dynamics, SPHP rice distribution and Rice Food Assistance were also expected to contribute to broader macroeconomic stability through their effects on consumer inflation.

Table 4 indicates that the volatility of the General CPI in 2023 differed significantly from the corresponding volatility observed during all pre-intervention years. The significance values for each comparison were below the 0.05 threshold, indicating statistically significant changes in inflation dynamics following the implementation of SPHP rice distribution and Rice Food Assistance. These findings suggest that the policy interventions altered the behavior of aggregate consumer prices and contributed to changes in overall inflation stability.

Table 4. Differences in General Consumer Price Index Volatility Before and During Policy Intervention

Comparison Period	Sig.	Conclusion
2019 vs. 2023	0.000	Significant Difference
2020 vs. 2023	0.000	Significant Difference
2021 vs. 2023	0.000	Significant Difference
2022 vs. 2023	0.000	Significant Difference

Source: Processed SPSS 22 output (2026)

Although the statistical tests confirm the existence of significant differences, a closer examination of annual CPI trends reveals a more complex picture. Throughout 2019–2023, the General CPI experienced fluctuations reflecting changes in consumer prices across multiple expenditure categories. The lowest average CPI value was recorded in April 2020 at 102.60, while the highest value occurred in August 2019 at 146.70. Based on annual volatility measurements, the most stable inflation environment was observed in 2020, when the CV reached only 0.41%, whereas 2019 recorded the highest volatility level at 1.98%. Consequently, the intervention year of 2023 did not represent the most stable inflation period during the entire observation horizon. This finding suggests that the implementation of SPHP rice distribution alone was insufficient to generate a substantial improvement in aggregate CPI stability.

Such a result is understandable given the multidimensional nature of the General CPI. Unlike rice prices, which are directly influenced by government food interventions, the General CPI reflects price movements across a broad range of goods and services, including housing, transportation, energy, education, health care, and communication. As a result,

fluctuations in aggregate inflation are shaped by numerous factors beyond food market interventions, including fuel prices, exchange rate movements, logistics costs, and broader macroeconomic conditions. Consequently, the stabilizing effects of rice-related policies may become diluted when assessed through a comprehensive inflation indicator that captures the entire consumption basket.

To better understand the temporal effects of policy implementation, volatility was further analyzed across four observation periods (P1–P4) using CV, CCV, and SDD measurements. The results are summarized in Table 5.

Table 5. Volatility Indicators of the General Consumer Price Index (CV, CCV, and SDD)

No	Year	P1 (%)			P2 (%)			P3 (%)			P4 (%)		
		CV	CCV	SDD	CV	CCV	SDD	CV	CCV	SDD	CV	CCV	SDD
1	2019	0.21	20.91	0.44	1.30	1.44	0.02	0.64	0.19	0.48	0.65	11.98	0.27
2	2020	0.10	9.61	22.78	0.21	20.21	0.50	0.11	0.07	0.18	0.58	8.66	0.17
3	2021	0.23	23.03	0.50	0.15	5.81	0.14	0.16	0.12	0.29	0.42	15.52	0.29
4	2022	0.20	19.85	0.93	0.60	9.62	0.23	0.15	0.15	0.37	0.69	60.02	1.07
5	2023	0.27	26.88	0.88	0.13	12.57	0.31	0.15	0.10	0.24	0.51	19.50	0.35

Source: Processed SPSS 22 output (2026)

The period-based analysis provides important insights into the mechanisms through which food distribution programs may influence inflation dynamics. During Period 1 (January–February 2023), when SPHP rice distribution had begun but Rice Food Assistance had not yet been implemented, volatility remained relatively higher than the lowest volatility levels recorded before the intervention period. The CV value of 0.27% in 2023 exceeded the corresponding value of 0.10% observed in 2020, indicating that supply-side intervention alone did not substantially reduce CPI volatility.

A similar pattern emerged during Period 3 (June–August), when SPHP distribution continued but the first phase of Rice Food Assistance had already ended. The volatility indicators recorded during 2023 remained slightly higher than those observed during the most stable pre-intervention year. These findings suggest that SPHP rice distribution, while potentially beneficial for ensuring market availability, was not sufficient on its own to generate a pronounced stabilization effect at the aggregate inflation level.

A different outcome becomes evident during Period 2 (March–May 2023), when SPHP rice distribution was implemented simultaneously with the first phase of Rice Food Assistance targeting low-income beneficiary households. During this period, the CV value reached 0.13%, representing the lowest volatility level among all observations except the exceptional conditions recorded during 2020. More importantly, Period 2 of 2023 exhibited lower volatility than the corresponding periods in 2019, 2021, and 2022. This pattern indicates that the combined implementation of market stabilization and social protection measures contributed to moderating inflation fluctuations more effectively than supply-side intervention alone.

From a policy perspective, this finding highlights the importance of integrating food market interventions with targeted social assistance. The distribution of SPHP rice increased food availability in commercial markets and reduced the likelihood of supply shortages, while Rice Food Assistance directly lowered the purchasing pressure exerted by vulnerable households on the retail rice market. Together, these interventions appear to have generated a complementary effect that reduced inflationary pressures and improved overall price stability. This mechanism supports emerging evidence from food security and social protection literature suggesting that food assistance programs can function not only as welfare instruments but also as tools for macroeconomic stabilization when integrated with market-based interventions (OECD, 2023; IFPRI, 2024).

While the previous analysis demonstrated that SPHP rice distribution and Rice Food Assistance contributed to changes in aggregate inflation dynamics, their effectiveness in stabilizing food-related inflation requires separate examination. This distinction is important because the Consumer Price Index (CPI) for the Food, Beverage, and Tobacco expenditure group is inherently more sensitive to supply shocks, seasonal fluctuations, and commodity-specific price movements than the General CPI. To assess the impact of government interventions on food-related inflation stability, volatility was measured using the Coefficient of Variation (CV), Corrected Coefficient of Variation (CCV), and Standard Deviation of Log Price Differences (SDD). Given that the 2019 data were not normally distributed, the comparison between 2019 and 2023 employed the Wilcoxon signed-rank test, while comparisons between 2020–2022 and 2023 utilized paired-sample t-tests.

Table 6 shows the significant differences existed between 2023 and the years 2019–2021. However, no statistically significant difference was observed between 2022 and 2023. These findings suggest that although the implementation of SPHP rice distribution and Rice Food Assistance altered food-related inflation dynamics relative to earlier years, the magnitude of these changes was insufficient to distinguish 2023 from the immediately preceding year. Consequently, the statistical evidence provides only partial support for the effectiveness of the interventions in stabilizing food-sector inflation.

Table 6. Differences in Food, Beverage, and Tobacco CPI Volatility Before and During Policy Intervention

Comparison Period	Test Statistic	Sig.	Conclusion
2019 vs. 2023	Z = -0.305	0.002	Significant Difference
2020 vs. 2023	–	0.000	Significant Difference
2021 vs. 2023	–	0.000	Significant Difference
2022 vs. 2023	–	0.587	No Significant Difference

Source: Processed SPSS 22 output (2026)

Despite these statistically significant differences, the annual volatility profile reveals that 2023 was not the most stable period during the observation horizon. The Food, Beverage, and Tobacco CPI experienced considerable fluctuations between 2019 and 2023. The lowest index value was recorded in September 2020 at 101.28, while the highest value occurred in December 2019 at 148.84. Annual volatility indicators show that the most stable conditions

were observed in 2021, with a CV of only 0.80%, whereas the highest volatility occurred in 2022, when the CV reached 2.19%. These findings suggest that the intervention year did not outperform all previous years in terms of inflation stability within the food sector.

To obtain a more nuanced understanding of policy effects, volatility was further examined across four intervention periods (P1–P4). The results are presented in Table 7.

Table 7. Volatility Indicators of the Food, Beverage, and Tobacco CPI (CV, CCV, and SDD)

No	Year	P1 (%)			P2 (%)			P3 (%)			P4 (%)		
		CV	CCV	SDD	CV	CCV	SDD	CV	CCV	SDD	CV	CCV	SDD
1	2019	0.01	0.97	0.77	0.19	7.15	0.17	0.08	0.01	0.02	0.72	37.83	0.72
2	2020	0.29	29.49	26.40	0.45	45.11	1.11	0.61	0.20	0.50	1.61	34.14	0.71
3	2021	0.78	78.13	1.58	0.20	9.92	0.24	0.43	0.34	0.84	0.70	33.33	0.58
4	2022	0.58	58.11	2.38	0.83	42.84	1.05	0.87	0.33	0.81	2.00	181.42	3.26
5	2023	0.59	59.05	2.15	0.53	51.93	1.27	0.13	0.13	0.32	1.14	53.88	0.98

Source: Processed SPSS 22 output (2026)

The period-specific analysis provides little evidence that the interventions consistently reduced volatility within the food expenditure group. During Period 1 (January–February), the lowest volatility was recorded in 2019 before the implementation of either SPHP rice distribution or Rice Food Assistance. The CV, CCV, and SDD values observed in 2023 were substantially higher than those recorded during the pre-intervention benchmark period. A similar pattern was evident during Period 2 (March–May), when both SPHP rice distribution and the first phase of Rice Food Assistance were implemented simultaneously. Although volatility declined relative to some previous years, the indicators remained above the levels recorded in 2019.

The results become more revealing when examining Period 3 (June–August). During this period, the volatility indicators in 2023 reached relatively low levels, particularly the CV value of 0.13%, suggesting some degree of stabilization. Nevertheless, volatility remained higher than the exceptionally low levels observed in 2019. Likewise, during Period 4, the lowest volatility was observed in 2021 rather than in the intervention year. Collectively, these patterns indicate that the implementation of SPHP rice distribution and Rice Food Assistance did not generate the lowest levels of volatility observed throughout the study period.

These findings suggest that interventions targeting rice markets alone may be insufficient to stabilize the broader Food, Beverage, and Tobacco expenditure group. Although rice is the most important staple food commodity in Indonesia, this expenditure category encompasses a wide range of products, including vegetables, fruits, meat, fish, eggs, cooking oil, beverages, and tobacco products. Many of these commodities are highly susceptible to seasonal production cycles, extreme weather events, transportation disruptions, and fluctuations in domestic and international commodity markets. Consequently, stabilization in one commodity does not necessarily translate into stability across the entire food basket.

The limited impact of the intervention can also be understood from the scale of market coverage. In 2023, Medan's population reached approximately 2.49 million inhabitants, generating an estimated annual rice consumption requirement of 266.4 million kilograms. During the same period, SPHP rice distribution reached approximately 44.65 million kilograms, equivalent to 16.76% of total rice consumption needs. Rice Food Assistance contributed an additional 21.36 million kilograms, representing approximately 8.02% of annual consumption requirements. Combined, the two programs supplied approximately 66.02 million kilograms of rice, or 24.78% of total annual rice demand in Medan.

From a market equilibrium perspective, this volume is substantial and likely contributed to stabilizing rice availability and reducing pressures within the rice market itself. However, because the Food, Beverage, and Tobacco CPI reflects price movements across a much broader range of commodities, the stabilizing effects of rice-related interventions may have been diluted by volatility originating from other food products. This interpretation is consistent with market equilibrium theory, which emphasizes that equilibrium outcomes depend on interactions across multiple commodities and market segments rather than a single product category.

The findings also underscore the importance of maintaining adequate public rice reserves as a strategic instrument for food security and market stabilization. Government rice stocks serve as a buffer against climate-related uncertainties, including droughts, excessive rainfall, El Niño events, and disruptions to agricultural production and distribution systems. In such circumstances, public reserves enable governments to maintain market supply, moderate price spikes, and protect household purchasing power. Nevertheless, the present findings indicate that while these interventions may be effective in stabilizing rice markets, their influence on broader food inflation remains constrained.

A further explanation lies in the structural differences between the General CPI and the Food, Beverage, and Tobacco CPI. Food-related inflation belongs to the category commonly referred to as *volatile food inflation*, which is highly responsive to harvest outcomes, weather conditions, natural disasters, pest outbreaks, and fluctuations in domestic and international food prices. In contrast, the General CPI is dominated by a wider set of expenditure groups, including housing, transportation, education, health care, and other services. Consequently, instability within food prices may coexist with relatively stable aggregate inflation because fluctuations in one expenditure group can be offset by stability in others.

Previous studies have similarly demonstrated that food commodity shocks exert stronger effects on food-related inflation than on aggregate inflation indicators. Research by Sari et al. (2023) found that global price shocks in rice, corn, and soybeans significantly affected food expenditure inflation, whereas broader inflation dynamics were more strongly influenced by macroeconomic variables such as money supply. Likewise, recent evidence from monetary authorities suggests that general inflation can remain relatively stable even when volatile food inflation experiences substantial fluctuations because core inflation and administered prices continue to anchor overall price expectations. These mechanisms help explain why the interventions examined in this study were able to contribute to rice market

stability and partially influence aggregate inflation while failing to generate a comparable stabilizing effect on the Food, Beverage, and Tobacco CPI.

CONCLUSION

The results show that the integration of SPHP Rice and Rice Food Assistance Distribution significantly reduces rice price volatility. However, this integration is unable to lower rice prices, thus not being able to strengthen purchasing power and affordability of low-income communities for basic needs. Furthermore, this integration also reduces the volatility of the General CPI, although at the same time it does not reduce the volatility of the CPI for Expenditure Group 01, which is heavily influenced by shocks such as harvest conditions, natural disasters, and climate, thus tending to have higher volatility. That food market stabilization in urban areas is more effectively achieved through the interaction of supply-side market management and demand-side social protection rather than through a single policy instrument. These complementary mechanisms within a unified analytical framework, this study provides evidence that food assistance policies can serve not only as welfare instruments but also as supporting mechanisms for inflation management and market stabilization. The findings contribute to a more integrated understanding of the relationship between food security, social protection, and price stabilization in developing urban food systems, while highlighting the importance of coordinated policy design for strengthening food resilience and consumer welfare.

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