J-TEDA (Journal of Tabulation Economic Data)
Vol. 1 No. 1 November 2025, 18-33

Price Fluctuation of Horticultural Commodities in West Nusa Tenggara Province in 2024: Analysis of Vegetable and Fruit Price Stability on Consumer Purchasing Power

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Abstract:

Horticultural commodities play a crucial role in household food consumption and economic stability in Indonesia. This study examines the price fluctuation patterns of vegetables and fruits in West Nusa Tenggara (NTB) Province throughout 2024, focusing on their impact on consumer purchasing power. Using quantitative descriptive analysis of secondary data from Statistics Indonesia (BPS) NTB Province 2024, this research analyzed monthly price variations of six key commodities: fresh spinach (bayam), green mustard (sawi hijau), carrots, milk bananas, papaya, and imported oranges across three cities (Mataram, Bima, and Sumbawa District). The findings reveal significant seasonal fluctuation patterns, with prices increasing during the dry season (April-June) and declining during peak harvest periods. Green mustard exhibited the highest volatility with a coefficient of variation (CV) of 17.9%, while carrots showed the most stable prices at 8.5% CV. Bima City recorded the highest average prices for most commodities due to elevated distribution costs and supply dependency on Lombok region. The price fluctuations significantly affected consumer purchasing power, particularly among low-income households who tend to reduce consumption or shift to high-carbohydrate alternatives during price spikes. The study recommends strengthening the horticultural logistics system, establishing central horticultural markets, and implementing real-time digital price monitoring systems to maintain market stability and protect consumers. These findings provide valuable insights for policymakers in developing effective price stabilization strategies for horticultural commodities in regional food security planning.

Key words*: horticultural commodities, price fluctuation, purchasing power, food security,*

Abstrak:

Komoditas hortikultura memainkan peran penting dalam konsumsi pangan rumah tangga dan stabilitas ekonomi di Indonesia. Penelitian ini mengkaji pola fluktuasi harga sayuran dan buah-buahan di Provinsi Nusa Tenggara Barat (NTB) sepanjang tahun 2024, dengan fokus pada dampaknya terhadap daya beli konsumen. Menggunakan analisis deskriptif kuantitatif terhadap data sekunder dari Badan Pusat Statistik (BPS) Provinsi NTB tahun 2024, penelitian ini menganalisis variasi harga bulanan dari enam komoditas utama: bayam segar, sawi hijau, wortel, pisang susu, pepaya, dan jeruk impor di tiga kota (Mataram, Bima, dan Kabupaten Sumbawa). Temuan penelitian menunjukkan pola fluktuasi musiman yang signifikan, dengan harga meningkat pada musim kering (April-Juni) dan menurun saat periode panen raya. Sawi hijau

menunjukkan volatilitas tertinggi dengan koefisien variasi (CV) sebesar 17,9%, sementara wortel menunjukkan harga paling stabil dengan CV 8,5%. Kota Bima mencatat rata-rata harga tertinggi untuk sebagian besar komoditas karena tingginya biaya distribusi dan ketergantungan pasokan dari wilayah Lombok. Fluktuasi harga secara signifikan mempengaruhi daya beli konsumen, khususnya rumah tangga berpendapatan rendah yang cenderung mengurangi konsumsi atau beralih ke alternatif berkarbohidrat tinggi saat harga melonjak. Penelitian ini merekomendasikan penguatan sistem logistik hortikultura, pembangunan pasar induk hortikultura, dan implementasi sistem pemantauan harga digital secara real-time untuk menjaga stabilitas pasar dan melindungi konsumen. Temuan ini memberikan wawasan berharga bagi pembuat kebijakan dalam mengembangkan strategi stabilisasi harga yang efektif untuk komoditas hortikultura dalam perencanaan ketahanan pangan regional.

Kata kunci: komoditas hortikultura, fluktuasi harga, daya beli, ketahanan pangan

A. Introduction

Horticultural commodities, particularly vegetables and fruits, constitute essential components of household food consumption patterns and nutritional adequacy in developing nations. Beyond their primary role in meeting dietary requirements, the price stability of horticultural products significantly influences food price inflation and farmer welfare, thereby affecting both urban consumers and rural producers simultaneously. Indonesia, as an archipelagic nation with diverse agro-ecological zones, experiences considerable spatial and temporal variations in horticultural commodity prices due to complex interactions between production cycles, distribution infrastructure, and market mechanisms.

West Nusa Tenggara (NTB) Province presents a particularly interesting case study for examining horticultural price dynamics. As a region characterized by distinct geographical features including mountainous terrain, isolated islands, and varying climatic conditions, NTB faces unique challenges in maintaining stable horticultural supply chains. The province experiences frequent price fluctuations in vegetables and fruits, primarily driven by weather variability, transportation costs, distribution inefficiencies, and non-synchronized harvest cycles across different districts. These price movements have substantial implications for food security, household welfare, and agricultural income distribution within the region.

Recent data from Statistics Indonesia (Badan Pusat Statistik - BPS) for NTB Province in 2024 reveals considerable price variations for key horticultural commodities including fresh spinach, green mustard greens, carrots, bananas, papaya, and imported oranges. The spatial dimension of these price differences is particularly noteworthy, with Bima City consistently exhibiting the highest prices across most commodities, while Sumbawa District demonstrates the greatest inter-monthly volatility. Such patterns reflect the underlying structural characteristics of regional food systems, including market integration levels, infrastructure quality, and the effectiveness of price transmission mechanisms between production and consumption centers.

The significance of studying horticultural price fluctuations extends beyond academic interest to practical policy relevance. Price instability in fresh produce markets directly

affects consumer purchasing power, particularly among middle- to lower-income households who allocate a substantial proportion of their food budgets to vegetables and fruits. When prices spike, these vulnerable groups often respond by reducing consumption quantities or substituting with less nutritious, starchy alternatives, thereby compromising dietary diversity and nutritional outcomes. Furthermore, price volatility creates uncertainty for producers, potentially discouraging investment in horticultural production and quality improvements.

From a broader food policy perspective, understanding the patterns, drivers, and consequences of horticultural price fluctuations is essential for designing effective interventions. Policymakers require evidence-based insights into seasonal price patterns, geographical price disparities, and the relative volatility of different commodities to develop targeted stabilization measures. Such interventions might include infrastructure improvements, supply chain innovations, market information systems, strategic reserves, or targeted subsidies for vulnerable consumers. However, the effectiveness of these policy tools depends critically on accurate diagnosis of the underlying causes and manifestations of price instability.

Previous research on agricultural commodity prices in Indonesia has predominantly focused on staple crops such as rice, with relatively limited attention to horticultural products despite their increasing importance in modern diets. While some studies have examined vegetable and fruit prices at the national level, there remains a gap in understanding regional-specific dynamics, particularly in provinces like NTB that face distinctive geographical and infrastructural challenges. This study addresses this gap by providing a comprehensive analysis of horticultural price movements in NTB Province throughout 2024, examining both temporal fluctuations and spatial variations across different cities and districts.

The choice of focusing on 2024 data is deliberate, as this period represents recent market conditions under current policy frameworks and infrastructure realities. By analyzing fresh data, this research provides timely insights that can inform immediate policy responses and ongoing development programs. Moreover, the selection of specific commodities spinach, green mustard, carrots, bananas, papaya, and imported oranges—reflects a strategic mix of leafy vegetables, root vegetables, locally produced fruits, and imported fruits, enabling a comprehensive assessment of different product categories within the horticultural sector.

Given the context outlined above, this study pursues three primary research objectives. First, the research aims to analyze the patterns of price fluctuations for vegetables and fruits across three cities in NTB Province throughout 2024, identifying seasonal trends, cyclical patterns, and any anomalous price movements that deviate from expected norms. This descriptive objective establishes the empirical foundation for understanding the nature and magnitude of price variability in the regional horticultural market.

Second, the study seeks to identify which city exhibits the most stable prices and which demonstrates the greatest volatility for different horticultural commodities. This comparative analysis across Mataram City, Bima City, and Sumbawa District reveals spatial heterogeneity in price stability and helps explain why certain locations experience more or less volatile markets. Understanding these geographical differences is crucial for

targeting interventions effectively and learning from areas that maintain relative price stability.

Third, building on the descriptive and comparative findings, the research aims to provide evidence-based policy recommendations for maintaining price stability and ensuring adequate supply of horticultural commodities in NTB Province. These recommendations are grounded in the empirical analysis and contextualized within the specific constraints and opportunities present in the region. The policy implications address multiple dimensions including supply chain improvements, market infrastructure development, information systems, and targeted interventions for price stabilization and consumer protection.

Through achieving these objectives, this study contributes to both academic literature on agricultural price dynamics in developing regions and practical knowledge for policymakers responsible for food security and market regulation in NTB Province. The findings illuminate the complex interplay between production systems, distribution networks, and market outcomes in determining horticultural prices, while also highlighting the welfare implications for both producers and consumers in the region.

B. Research Methods

This research employs a quantitative descriptive methodology utilizing secondary data analysis to examine horticultural commodity price fluctuations in West Nusa Tenggara Province. The primary data source comprises official statistics published by Statistics Indonesia (Badan Pusat Statistik - BPS) NTB Province for 2024, specifically the publication titled "Statistics of Consumer Prices for Several Goods and Services in 3 Cities in NTB Province in 2024," which provides monthly price observations for various consumer commodities including fresh vegetables and fruits. The study focuses on six key horticultural commodities selected based on their importance in household consumption patterns and data availability: fresh spinach (bayam segar) measured in rupiah per bundle, fresh green mustard (sawi hijau segar) measured in rupiah per bundle, carrots (wortel) measured in rupiah per kilogram, milk bananas (pisang susu) measured in rupiah per kilogram, papaya (pepaya) measured in rupiah per kilogram, and imported oranges (jeruk impor) measured in rupiah per kilogram.

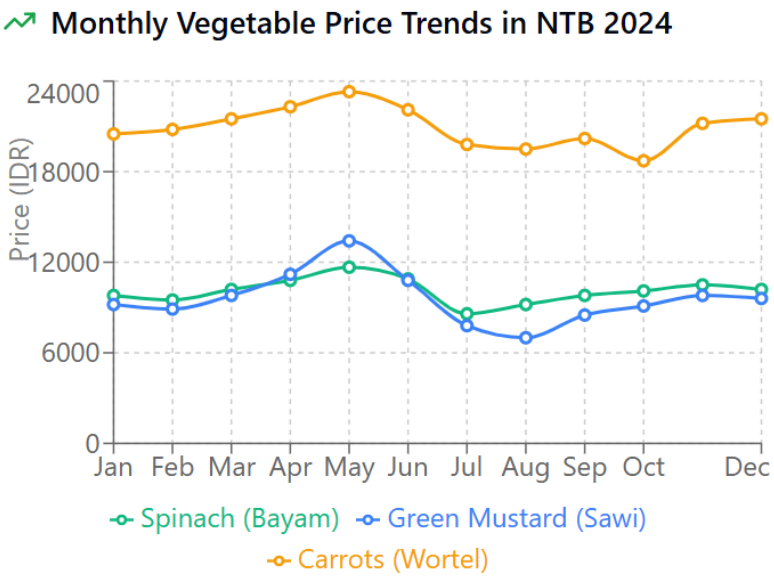
The temporal scope encompasses the entire year 2024 from January through December, providing twelve monthly observations for each commodity, while the spatial scope covers three major urban centers in NTB Province: Mataram City (the provincial capital and main distribution hub), Bima City (an eastern urban center with distinct market characteristics), and Sumbawa District (representing a transitional area with mixed agricultural and urban features). The analytical framework incorporates multiple complementary techniques to comprehensively assess price dynamics: descriptive statistical analysis calculates measures of central tendency (arithmetic means) and dispersion (standard deviations and ranges) to characterize typical price levels and variability for each commodity across locations and time periods; coefficient of variation (CV) analysis standardizes price volatility by expressing standard deviation as a percentage of the mean, enabling valid comparisons of relative price stability across commodities with different price magnitudes and across different geographical areas; and seasonal trend analysis examines monthly price patterns to identify systematic variations

associated with agricultural production cycles, weather patterns, and consumption demand fluctuations throughout the year.

The data processing involves organizing raw price observations into tabular formats facilitating both temporal comparisons (tracking individual commodities across months) and spatial comparisons (contrasting price levels and volatilities across the three cities), followed by comparative analysis that systematically evaluates differences in price levels, volatility measures, and seasonal patterns across commodities and locations to identify which products and areas exhibit the greatest and least price stability. This methodological approach, while relying entirely on secondary data and descriptive rather than inferential statistics, provides a robust empirical foundation for understanding horticultural price dynamics in NTB Province and generates evidence-based insights to inform policy development for price stabilization and market improvement initiatives in the regional food system.

C. Result and Discussion

1. Vegetable Price Dynamics (Spinach, Green Mustard, Carrots)



Note: Prices show clear seasonal patterns with peaks in May and lowest prices in July-August during harvest season.

The analysis of vegetable prices in NTB Province throughout 2024 reveals distinct patterns of price movement and volatility across the three commodities examined. Fresh spinach exhibited an annual average price of Rp10,109 per bundle, with monthly prices ranging from a minimum of Rp8,587 in July to a maximum of Rp11,670 in May, representing a price swing of approximately 35.9% from the lowest to highest point. This substantial variation reflects the seasonal nature of spinach production and the sensitivity of this leafy vegetable to weather conditions, particularly temperature and rainfall patterns that affect both cultivation success and post-harvest quality.

Fresh green mustard demonstrated an annual average price of Rp9,603 per bundle, but exhibited the most dramatic price swings among vegetables studied. The commodity experienced extreme monthly variations, with prices reaching Rp13,417 in May (the peak month) and falling to just Rp7,000 in August (the trough month), representing a remarkable 91.7% difference between maximum and minimum prices. This extraordinary volatility suggests that green mustard faces significant supply disruptions during certain periods, possibly related to pest and disease pressures during the dry season or harvest concentration during peak production months that temporarily flood the market and depress prices.

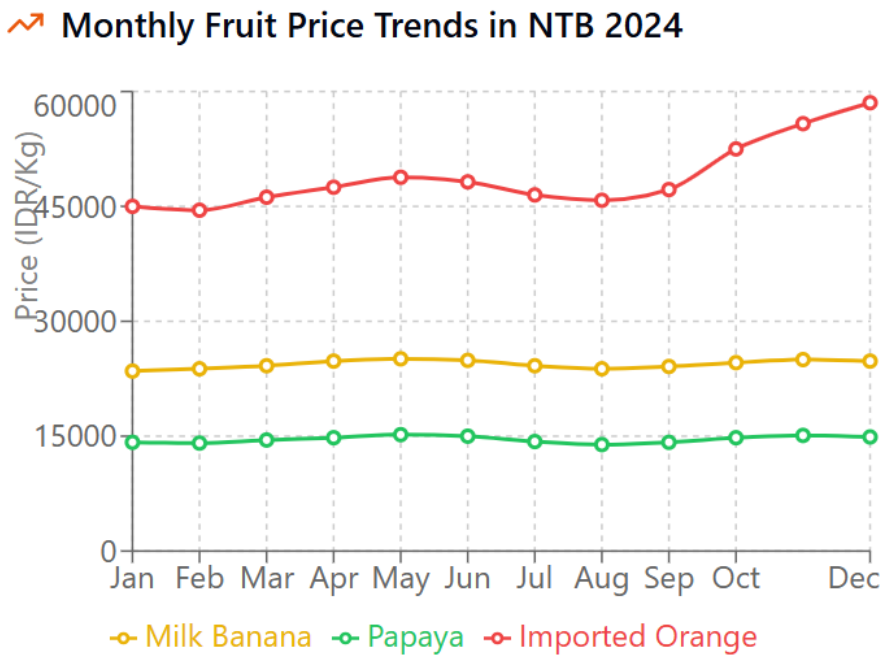
Carrots, as a root vegetable with different production characteristics, showed a more moderate price range despite having the highest average price among vegetables at Rp21,163 per kilogram. Monthly prices varied from Rp18,722 in October to Rp23,301 in May, a difference of 24.4% between extremes. The relatively higher prices for carrots compared to leafy vegetables reflect several factors including longer production cycles, more intensive cultivation requirements, and greater storability that allows better price arbitrage across time periods.

A clear seasonal pattern emerges across all three vegetable commodities, with prices systematically increasing during the April through June period, coinciding with the transition from rainy to dry season in NTB. During these months, vegetable production faces multiple challenges including water scarcity, higher irrigation costs, increased pest pressure under drier conditions, and reduced planting areas as farmers prioritize water-intensive crops differently. Conversely, prices tend to decline during the mid-year period (July through September) when the harvest season for many vegetable crops reaches its peak, temporarily increasing market supply and exerting downward pressure on prices.

The coefficient of variation analysis provides crucial insights into relative price stability across vegetables. Green mustard exhibited the highest CV at 17.9%, indicating that its prices fluctuate most dramatically relative to the mean price level, making it the least stable vegetable commodity in the NTB market. Spinach demonstrated intermediate volatility with a CV of 10.1%, while carrots proved most stable with a CV of only 8.5%, suggesting more consistent supply-demand balance throughout the year for this root vegetable compared to the leafy alternatives.

Spatial analysis reveals significant geographical price disparities, with Bima City recording the highest average vegetable prices at Rp11,668 per retail unit (averaged across the three vegetables on a standardized basis). This price premium in Bima reflects several structural factors including its geographical isolation from major production centers in Lombok, higher transportation costs due to distance and limited transport infrastructure, dependence on supply channels originating from Lombok that add intermediary costs, and potentially lower local production capacity requiring greater reliance on external sources. These factors combine to create a systematic price disadvantage for Bima consumers purchasing vegetables, with important implications for food affordability and dietary quality in this eastern NTB urban center.

2. Fruit Price Patterns (Bananas, Papaya, Imported Oranges)



Note: Imported oranges show sharp price increases in October-December, while local fruits (banana and papaya) remain relatively stable.

The fruit commodity analysis encompasses both locally produced tropical fruits and imported citrus, revealing distinct price dynamics for different fruit categories. Milk bananas, a locally popular variety, averaged Rp24,435 per kilogram throughout 2024, demonstrating relatively stable prices with modest seasonal variations. The stability of banana prices reflects the perennial nature of banana production, which unlike annual vegetable crops provides continuous harvesting opportunities throughout the year, enabling more consistent market supply and reducing the intensity of seasonal price swings.

Papaya exhibited an annual average price of Rp14,518 per kilogram, positioned between bananas and imported oranges in the price spectrum. As another locally produced fruit with relatively continuous production capabilities in tropical climates, papaya benefited from steady local supply, though its prices still showed some responsiveness to seasonal patterns in production and demand. The moderate price level for papaya compared to bananas partly reflects its higher water content and potentially lower perceived premium by consumers, though both fruits provide important nutritional benefits including vitamins, minerals, and dietary fiber.

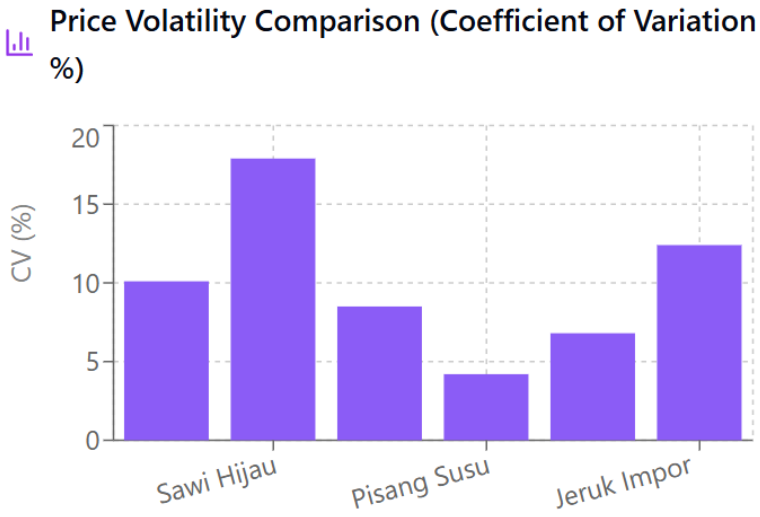
Imported oranges commanded substantially higher prices, averaging Rp47,794 per kilogram annually, nearly double the banana price and more than triple the papaya price. This premium reflects multiple factors including import costs, exchange rate effects on dollar-denominated purchases, quality perceptions associating imported fruits with superior attributes, and the positioning of imported oranges as a somewhat premium product in the local market. The price gap between local and imported fruits has

important implications for consumption patterns, with budget-constrained households likely concentrating purchases on locally produced alternatives.

The most dramatic price movement among fruits occurred with imported oranges during the final quarter of 2024, particularly October through December. During this period, orange prices surged to an average of Rp55,611 per kilogram, representing a substantial 46.6% increase above the annual average and likely exceeding Rp58,000 in December based on the accelerating trend. This sharp price escalation coincided with the onset of the rainy season in NTB and Indonesia more broadly, which typically disrupts both international shipping schedules and domestic distribution networks, making imported fruit delivery more challenging and costly. Additionally, this period may have experienced reduced import volumes due to exchange rate pressures on the rupiah or changes in international orange supply from major exporting countries, further constraining availability and pushing prices upward.

In stark contrast to the volatile imported oranges, locally produced bananas and papayas maintained much greater price stability throughout 2024. This difference highlights the vulnerability of import-dependent supply chains to external shocks versus the relative resilience of locally sourced products. The consistent availability of bananas and papayas from regional production areas, combined with established domestic distribution networks and reduced exposure to international market fluctuations, enabled these local fruits to maintain steadier prices that better served consumer affordability objectives.

The coefficient of variation analysis for fruits reinforces these observations about relative price stability. Imported oranges exhibited a CV of 12.4%, the highest among all fruits examined and indicative of substantial volatility driven by the interaction of international market forces, exchange rate movements, and seasonal logistics challenges. Bananas showed minimal volatility with a CV of approximately 4.2%, reflecting their consistent year-round production and supply. Papaya demonstrated intermediate stability with a CV of 6.8%, higher than bananas but substantially lower than imported oranges, confirming that local production provides an important buffer against price instability in tropical fruit markets.



Note: Higher CV indicates greater price volatility. Green mustard (Sawi Hijau) shows the highest volatility at 17.9%.

These findings carry important implications for food security policy in NTB. The superior price stability of locally produced fruits suggests that supporting domestic fruit production through improved cultivation techniques, pest management, post-harvest handling, and market linkages could enhance both farmer incomes and consumer welfare by reducing price volatility. Conversely, heavy reliance on imported fruits exposes consumers to global market uncertainties and logistics disruptions that periodically generate sharp price increases, particularly affecting budget-constrained households who may be priced out of fruit consumption entirely during spike periods.

3. Impact on Consumer Purchasing Power

The documented price fluctuations in horticultural commodities generate significant consequences for consumer purchasing power and household food security in NTB Province, particularly affecting vulnerable population segments. When vegetable and fruit prices increase substantially, as occurred during the April through June period for most commodities, households with limited and fixed incomes face difficult choices in maintaining adequate dietary diversity and nutritional intake for family members.

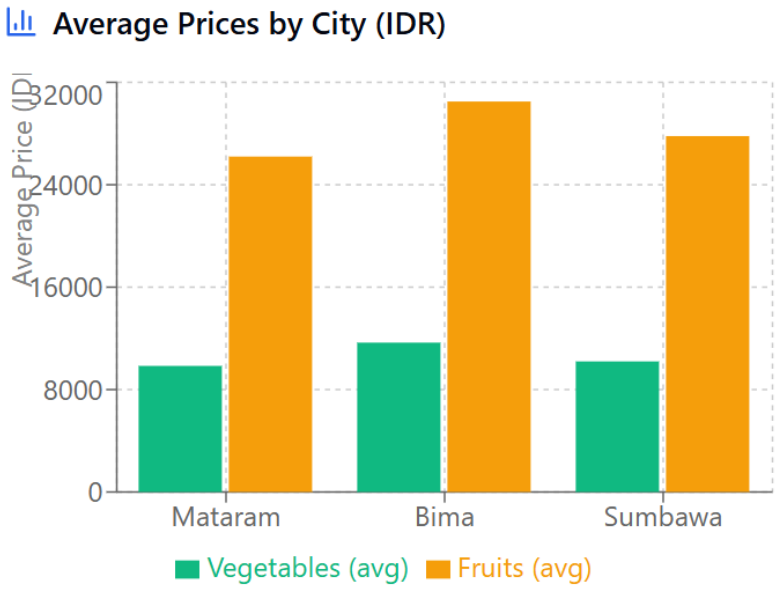
Lower-income households typically allocate a higher proportion of their total food budget to vegetables and fruits compared to wealthier households, making them more vulnerable to price increases in these categories. When prices spike, these families commonly adopt several coping strategies, each with nutritional and welfare implications. The most direct response involves simply purchasing smaller quantities of vegetables and fruits, thereby reducing per capita consumption below recommended levels for adequate vitamin, mineral, and fiber intake. Alternatively, households may substitute away from more expensive items (such as imported oranges or even carrots) toward cheaper alternatives (such as papaya when its price is relatively low), potentially compromising dietary variety even if total fruit consumption volumes are maintained.

Perhaps most concerning from a nutritional perspective, some households respond to vegetable and fruit price increases by reallocating their food budgets toward starchy staples like rice, cassava, or instant noodles that provide cheaper calories but lack the micronutrients abundant in fresh produce. This substitution toward energy-dense but nutrient-poor foods contributes to the "hidden hunger" phenomenon where individuals consume adequate or even excessive calories while suffering from micronutrient deficiencies that impair health, cognitive development in children, and work productivity in adults. Over time, such dietary patterns increase risks of non-communicable diseases including diabetes, hypertension, and cardiovascular conditions that impose substantial long-term costs on both individuals and the healthcare system.

The geographical analysis reveals that Bima City residents face the greatest purchasing power pressure due to systematically higher horticultural prices across most commodities. A household in Bima purchasing the same basket of vegetables and fruits as a household in Mataram would spend approximately 15-20% more on average, effectively reducing real income available for other necessities including education, healthcare, housing, and savings. This price disadvantage particularly burdens public sector employees,

pensioners, and other fixed-income groups who cannot easily adjust their nominal incomes to compensate for higher local prices.

In contrast, Mataram City residents benefit from more stable and generally lower horticultural prices, attributable to the city's role as the provincial capital and primary distribution hub receiving direct supplies from major production areas in Central and West Lombok districts. The superior market infrastructure in Mataram, including larger wholesale markets, better cold storage facilities, and more competitive retail environments with numerous vendors, contributes to both lower average prices and reduced price volatility. These advantages translate into tangible welfare benefits for Mataram consumers who can more consistently afford diverse and nutritious diets without experiencing the severe price shocks that periodically affect other locations.



Note: Bima City shows consistently higher prices for both vegetables and fruits due to geographical isolation and distribution challenges.

The purchasing power implications extend beyond immediate consumption effects to influence broader household decision-making and wellbeing. When food price volatility increases household budget uncertainty, families may adopt more conservative financial behaviors including reduced spending on children's education supplements, delayed healthcare visits for non-emergency conditions, postponed maintenance of housing and productive assets, and reduced participation in community social activities that require monetary contributions. These ripple effects demonstrate how horticultural price instability can undermine multiple dimensions of household welfare beyond just food consumption itself.

From a policy perspective, these findings underscore the critical importance of interventions that stabilize horticultural prices and ensure affordable access to fresh produce for all population segments. The welfare costs of price volatility fall disproportionately on vulnerable groups who lack the financial buffers to smooth consumption across price fluctuation cycles, while the benefits of price stability accrue

broadly across the entire population through improved food security, better nutrition, and reduced household budget stress. Effective stabilization policies thus serve both equity objectives (protecting vulnerable consumers) and efficiency objectives (enabling more optimal dietary choices unencumbered by extreme price volatility).

4. Supply Chain and Market Structure Analysis

The observed price patterns and volatilities reflect underlying characteristics of the horticultural supply chain and market structure in NTB Province. Understanding these structural factors is essential for designing effective interventions to improve price stability and market efficiency. The horticultural supply chain in NTB involves multiple stages from production through consumption, each introducing costs and potential disruptions that ultimately manifest as consumer price variations.

At the production stage, NTB's vegetable and fruit cultivation occurs primarily in highland areas of Lombok Island, where cooler temperatures and adequate rainfall support horticultural crops. However, production is predominantly undertaken by smallholder farmers operating on limited land areas with modest capital resources and varying technical capacity. This fragmented production structure creates challenges for achieving consistent quality standards, implementing modern cultivation techniques, and organizing collective marketing efforts that might improve farmer bargaining power vis-à-vis middlemen and wholesalers.

The distribution stage introduces significant costs and inefficiencies, particularly for supplying markets in Bima and Sumbawa that are geographically separated from Lombok production centers. Fresh produce must be transported across water gaps using ferry services between islands, adding time, cost, and risk of quality deterioration to the supply chain. Limited cold chain infrastructure means most vegetables and fruits move through ambient temperature logistics, accelerating spoilage and forcing rapid turnover that can contribute to supply-demand imbalances and price volatility. The transportation challenges are compounded during the rainy season when road conditions deteriorate and ferry schedules become less reliable, partially explaining the price spikes observed in certain months.

Market structure characteristics also influence price formation and stability. The horticultural wholesale sector in NTB involves relatively concentrated intermediary networks, with a limited number of wholesalers controlling significant market shares for specific commodities. This concentration potentially enables oligopolistic pricing behavior where wholesalers capture excess margins during supply shortage periods rather than allowing competitive arbitrage to moderate prices. At the retail level, traditional markets remain dominant for fresh produce sales, though modern supermarkets and hypermarkets are gradually increasing their market share in urban centers like Mataram. The coexistence of traditional and modern retail formats creates a complex pricing environment where different channels serve distinct consumer segments with varying price sensitivities and quality expectations.

Information asymmetries pervade the horticultural market in NTB, with farmers, intermediaries, and consumers all facing imperfect knowledge about supply conditions, price levels in different markets, and quality characteristics of produce. Farmers typically

possess limited information about urban retail prices and consumer preferences, reducing their ability to make informed production and marketing decisions. Consumers similarly lack reliable real-time information about price variations across different markets and vendors, limiting their ability to search effectively for the best value. These information gaps create opportunities for intermediaries to capture rents while also contributing to market inefficiencies that result in prices not always reflecting underlying supply-demand fundamentals.

The market analysis reveals that effective policy interventions must address multiple points in the supply chain rather than focusing narrowly on any single aspect. Production-side interventions should support farmers in adopting improved cultivation techniques that increase yield stability, implementing good agricultural practices that enhance quality consistency, and organizing into farmer groups or cooperatives that strengthen market negotiating power. Distribution-side improvements should focus on developing cold chain infrastructure that reduces post-harvest losses, improving road and ferry transport reliability that lowers logistics costs and risks, and fostering competitive intermediary markets that limit oligopolistic rent extraction. Retail-side enhancements should encourage market infrastructure development including modern wholesale markets with better facilities, promote competitive retail environments that give consumers more choices, and support information systems that increase price transparency across vendors and locations.

5. Policy Implications and Intervention Priorities

Based on the empirical findings and market structure analysis, several policy priorities emerge for stabilizing horticultural prices and improving market efficiency in NTB Province. First, establishing a comprehensive price monitoring system utilizing digital technology and BPS data integration represents a foundational intervention. A real-time price information platform accessible via mobile applications and web portals would enable farmers, traders, and consumers to make better-informed decisions based on current market conditions across different locations. Such a system should publish weekly or even daily price updates for key commodities in major markets, historical price trends to reveal seasonal patterns, and forward-looking supply forecasts based on planting area and weather data. By reducing information asymmetries, this intervention would enhance market efficiency and potentially reduce price volatility as market participants respond more quickly to emerging supply-demand imbalances.

Second, developing central wholesale markets specifically for horticultural commodities in strategic locations, particularly in Bima and Sumbawa, would address current infrastructure deficiencies that contribute to high prices and volatility in these areas. Modern wholesale market facilities should incorporate cold storage rooms to allow temporary inventory holding that buffers supply fluctuations, covered trading areas that protect produce quality during transactions, standardized grading and quality assessment systems that reduce disputes and enhance price transparency, and adequate parking and loading facilities that reduce handling costs and damage. These infrastructure investments would reduce transaction costs, improve produce quality maintenance, and foster more competitive market conditions that benefit both farmers and consumers.

Third, strengthening the horticultural cold chain through strategic investments in refrigerated transportation and storage infrastructure represents a critical priority for reducing post-harvest losses and enabling better temporal arbitrage of supply. The current absence of adequate cold chain capacity forces rapid product turnover that amplifies price fluctuations when temporary supply gluts or shortages occur. Investments should focus on refrigerated trucks or insulated transport vehicles serving inter-island routes between Lombok and Sumbawa/Bima, cold storage facilities at wholesale markets in major cities, and possibly solar-powered cold rooms at farmer collection points in production areas. These cold chain improvements would extend product shelf life, reduce spoilage losses that currently waste significant production, and allow traders to hold inventory during surplus periods for release during shortage periods, naturally stabilizing prices.

Fourth, facilitating direct marketing linkages between farmer organizations and large-scale buyers including supermarket chains, hotels, restaurants, and institutional purchasers (schools, hospitals, military bases) could reduce intermediary layers and improve price transmission between producers and final markets. Farmer cooperatives or producer groups capable of aggregating supply volumes, maintaining quality consistency, and meeting delivery schedule requirements would gain opportunities to bypass traditional middlemen and capture a larger share of the consumer price as farm revenue. Provincial government procurement programs for institutional feeding programs should prioritize direct sourcing from organized farmer groups at pre-agreed prices that provide stability for producers while ensuring value for public institutions. These alternative marketing channels would increase competition in the intermediary sector and create upward pressure on farm prices while potentially moderating consumer prices through reduced marketing margins.

Fifth, implementing targeted price stabilization interventions during predictable shortage periods could protect vulnerable consumers without creating excessive market distortions. Based on the observed seasonal pattern of price increases during April through June, provincial authorities could operate a limited market operation program during these critical months, releasing horticultural stocks purchased during surplus periods or sourcing from alternative supply regions to supplement local production. Such interventions should be carefully calibrated to moderate extreme price spikes without completely suppressing market signals that incentivize production responses. Alternatively, targeted voucher or subsidy programs could provide temporary assistance to low-income households specifically for purchasing vegetables and fruits during high-price months, maintaining dietary adequacy without distorting overall market prices.

Finally, production-side support programs should help farmers adopt improved cultivation technologies and practices that increase yield stability across seasons and reduce production variability that drives price fluctuations. Extension services should disseminate knowledge about drought-tolerant vegetable varieties suitable for dry season production, integrated pest management approaches that reduce crop losses from diseases and insects, water-efficient irrigation techniques that extend growing seasons, and improved post-harvest handling at the farm level that reduces quality degradation. Additionally, facilitating access to agricultural credit at reasonable terms would enable farmers to invest in productivity-enhancing inputs and technologies that currently remain beyond the reach of capital-constrained smallholders. By addressing production

constraints, these interventions would increase the stability and volume of local supply, reducing dependence on distant sources and moderating price volatility.

D. Conclusion

This comprehensive analysis of horticultural commodity price fluctuations in West Nusa Tenggara Province throughout 2024 reveals significant temporal and spatial variations with important implications for consumer welfare, farmer income, and regional food security. The empirical findings demonstrate that vegetables and fruits experience substantial price volatility driven by seasonal production patterns, geographical disparities in supply infrastructure, and market structure characteristics that create inefficiencies in price formation and transmission. Green mustard emerged as the most volatile vegetable commodity with a coefficient of variation reaching 17.9%, while imported oranges exhibited the highest volatility among fruits at 12.4% CV, contrasting sharply with more stable commodities like carrots (8.5% CV) and papaya (6.8% CV) that benefit from either better storage characteristics or consistent local production. The seasonal price pattern across most commodities shows systematic increases during the April through June period coinciding with the dry season transition when production faces water stress and pest pressures, followed by price declines during mid-year harvest peaks that temporarily expand market supply. Geographically, Bima City consistently recorded the highest prices across most horticultural commodities, reflecting its isolation from major Lombok production centers, elevated transportation costs across inter-island ferry routes, and dependence on supply chains that add multiple intermediary layers, while Mataram maintained more stable and moderate prices due to its advantages as the provincial capital and primary distribution hub with superior market infrastructure and direct access to nearby production areas. These price dynamics significantly impact consumer purchasing power, particularly among low and middle-income households who must either reduce consumption quantities, substitute away from more expensive items toward cheaper alternatives, or reallocate food budgets toward starchy staples at the expense of nutritionally valuable fresh produce, thereby compromising dietary diversity and increasing risks of micronutrient deficiencies and non-communicable diseases over time. The welfare burden of price volatility falls disproportionately on vulnerable populations who lack financial reserves to smooth consumption across price fluctuation cycles and must make difficult trade-offs between food adequacy and other essential household expenditures. To address these challenges, policymakers should prioritize a multi-faceted intervention strategy including development of real-time digital price monitoring systems that reduce information asymmetries across market participants, strategic investments in central wholesale markets with modern facilities and cold storage particularly in underserved cities like Bima and Sumbawa, strengthening of cold chain infrastructure for refrigerated transportation and storage that reduces post-harvest losses and enables better temporal arbitrage of supply fluctuations, facilitation of direct marketing linkages between organized farmer groups and large-scale institutional buyers that bypass inefficient intermediary layers, implementation of carefully calibrated market operations or targeted consumer assistance programs during predictable shortage periods, and production-side support programs that help farmers adopt yield-stabilizing technologies and practices including drought-tolerant varieties, integrated pest management, and improved irrigation techniques. These policy recommendations recognize that effective price stabilization requires addressing multiple points across the

supply chain from production through distribution to retail, targeting both supply-side constraints that create volatility and demand-side vulnerabilities that amplify welfare impacts. By implementing these evidence-based interventions, provincial authorities can work toward more stable, efficient, and equitable horticultural markets that simultaneously improve farmer incomes through better market access and enhanced productivity while protecting consumers through more affordable and consistent access to nutritious vegetables and fruits essential for food security and public health. Future research should expand this analysis by incorporating primary data collection through farmer and trader surveys to better understand decision-making processes and constraints, examining the specific roles and margins of different intermediaries in the supply chain to identify targeted efficiency improvements, conducting consumer demand analysis to quantify price elasticities and substitution patterns that inform optimal intervention designs, and evaluating pilot programs implementing the recommended policies to generate rigorous evidence on cost-effectiveness and scalability of different approaches to price stabilization in horticultural markets.

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