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Trend of Carbohydrate Food Consumption in Urban Areas of South Sulawesi

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Abstract

This study aims to analyze the development trend of carbohydrate food consumption in urban areas of South Sulawesi Province. The data used are quarterly time-series secondary data from 2018 to 2025 sourced from the Central Bureau of Statistics (BPS), including the National Socio-Economic Survey (Susenas) data. The analytical method applied includes Ordinary Least Squares (OLS) linear trend analysis. The trend analysis results indicate a structural food transition in urban areas: per capita rice consumption experienced a significant downward trend ($y = -0.0072x + 7.3273$; $R^2 = 0.2365$). Conversely, wheat flour consumption showed an increasing trend ($y = 0.596x + 357.93$; $R^2 = 0.0686$). Meanwhile, local food such as cassava ($y = -1.6498x + 310.7$) and fast-food processed items like instant noodles ($y = -1.3174x + 383.98$) faced a decline in consumption. Accumulatively, total carbohydrate consumption in urban South Sulawesi remains relatively stable with a very slight downward trend ($y = -0.0009x + 7.7576$). The implications of this study emphasize the need for adaptive agribusiness supply chain management strategies responding to urban preference shifts from rice to wheat-based products without neglecting the strengthening of local foods.

Keywords: consumption trends, carbohydrate foods, urban areas, food transition.

INTRODUCTION

South Sulawesi Province holds a highly strategic role in the constellation of national agricultural development and food security. The region is consistently recognized as one of the primary food granaries, specifically as the largest rice producer in Eastern

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Indonesia. Behind its substantial contribution to national food supply stability, the region is not exempt from demographic challenges in the form of rapid urbanization across its regional economic growth centers. This transformation from rural to urban areas does not merely alter the physical landscape of the region; it gradually disrupts the demographic characteristics, daily activity patterns, and socio-economic values of the society. Massive urbanization creates a concentration of urban population that fundamentally changes people's lifestyles. This urban lifestyle shift acts as the primary driver for consumer preference changes in meeting daily staple food needs, which begin to move away from the region's original traditional food consumption patterns (Suryana, 2022).

In the urban ecosystem, lifestyle changes driven by heavy modernization trigger a visible nutrition transition at the household level. The highly dynamic characteristics of urban life demand high mobility, exposing the society to daily time constraints and increasingly tight work schedules. The pressure of professional activities and long commuting times drastically reduces the time allocated for conventional food preparation at home (Reardon et al., 2021). This condition systematically shifts urban society's preferences toward convenience foods that are more accessible and quick to serve. This transition points to a shift in staple energy consumption patterns from fresh foods or local foods requiring long preparation times to industrially processed products deemed far more efficient to support their daily productivity.

Literature on carbohydrate food consumption patterns in Indonesia has extensively documented the dynamics of public staple food demand. Ariani and Purwantini (2023) concluded that rice remains dominant in household food expenditure shares in Indonesia, while food diversification programs toward non-rice carbohydrates are progressing slowly due to cultural preference barriers and limited local non-rice food supplies in the market. On the other hand, Hermina and Prihatini (2022) explored how rising real incomes and price elasticity trigger a consumption shift from local staple foods to wheat flour-based processed foods in various major urban areas. However, most of these empirical studies generally utilize aggregate national macroeconomic data or focus on the Java Island region, thereby overlooking specific behavioral variations at the regional level, especially in areas serving as primary production centers.

Based on this problem formulation, this study explicitly aims to analyze the development trend of carbohydrate food consumption in the urban areas of South Sulawesi Province. More specifically, the study is directed at mapping quarterly consumption dynamics throughout the 2018–2025 period and identifying the direction of this structural food transition. Through a robust quantitative approach, the findings are

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expected to provide new theoretical contributions to agribusiness literature and urban consumer behavior, while also offering empirical insights for policymakers in designing food security and diversification strategies that are more adaptive to modern urban market dynamics.

RESEARCH METHODS

This research is designed as a quantitative descriptive and causal-explanatory study utilizing quarterly time-series secondary data from 2018 to 2025. Over an eight-year span, the total observation sample used in the estimation is 32 quarters (n = 32). The research location is focused on the urban aggregate of South Sulawesi Province. Primary data were collected through documentation methods from the National Socio-Economic Survey (Susenas) database of the Central Bureau of Statistics (BPS) of South Sulawesi Province, the Ministry of Trade, and the local Food Security Agency.

The data analysis technique employed Linear Trend Analysis using the Ordinary Least Squares (OLS) method to map the direction of consumption development over time, with the standard mathematical formulation:

$$y = a + bX$$

Where:

y = Dependent variable representing the volume of food consumption per capita per month (presented in kg/capita/month for total carbohydrates and rice; and grams/capita/month for wheat flour, cassava, and instant noodles).

X = Independent variable representing the quarterly time-series period (quarters 1 to 32).

a = Intercept constant indicating the baseline consumption value in the initial period.

b = Directional coefficient (slope) of the trend per quarter.

The mathematical validity of the model was tested using the coefficient of determination (R^2) to measure how much the time variation can explain the fluctuation patterns of each carbohydrate food commodity.

RESULTS AND DISCUSSION

Trend of Total Carbohydrate Food Consumption in Urban South Sulawesi

Based on the estimation results using the Ordinary Least Squares (OLS) method on quarterly time-series secondary data from 2018 to 2025, the development model of

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total carbohydrate food consumption in urban South Sulawesi is represented by the following linear equation:

$$y = -0.0009x + 7.7576 \quad (R^2 = 0.0023)$$

Empirically, the intercept constant value of 7.7576 indicates that in the initial observation period, the average total carbohydrate consumption of the urban population was at 7.7576 kg/capita/month. The directional coefficient or slope (b), which is a very small negative value of -0.0009, indicates that the rate of decline in total carbohydrate food consumption is exceedingly slow, even tending to be constant or horizontal from quarter to quarter. The coefficient of determination (R^2) of 0.0023 reinforces that quarterly time variation has almost no significant linear effect on the total volume of carbohydrates consumed. This quantitative phenomenon confirms the fundamental nature of carbohydrate foods as primary goods, which have highly inelastic demand with respect to time and income (Anindita & Baladina, 2021).

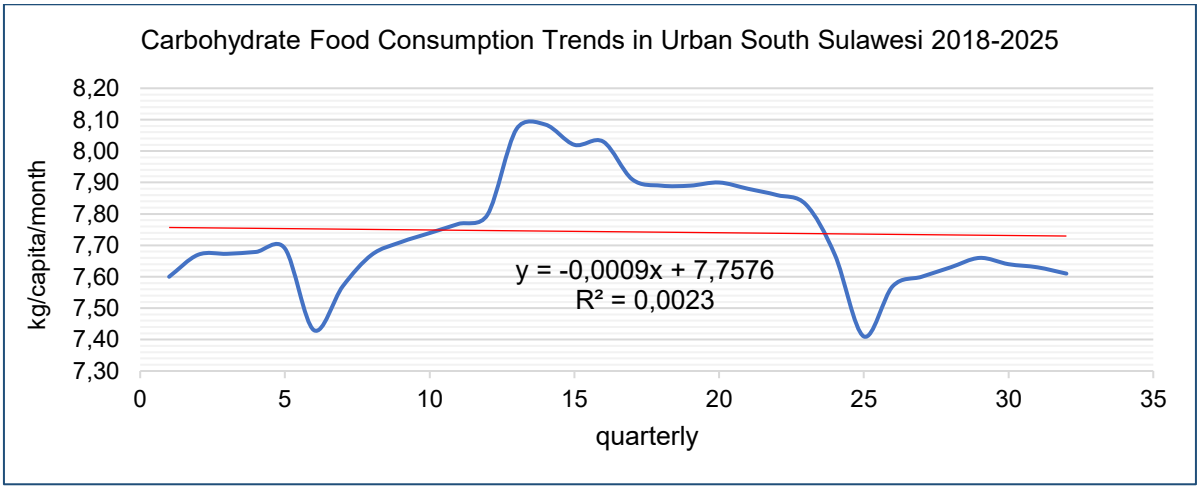


Figure 1. Carbohydrate Food Consumption Trends in Urban South Sulawesi 2018-2025

Although the macro trend appears stable in aggregate, graphical visualization reveals highly dynamic seasonal fluctuations. There are several sharp peaks and troughs throughout the 32 observation quarters. Total consumption spikes generally occur in quarters coinciding with religious holidays such as Ramadan and Eid al-Fitr, where

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household food expenditures in urban South Sulawesi experience a seasonal escalation (BPS, 2024). Conversely, sharp drops in specific quarters—such as those seen in the 6th and 25th quarters—represent economic external shocks. The decline in the 6th quarter (around 2019-2020) coincided with the initial phase of mobility restrictions due to the COVID-19 pandemic, which disrupted downstream supply chains, while the drop in the 25th quarter (around late 2023 or early 2024) strongly correlated with a surge in global food inflation that suppressed the real purchasing power of the urban population (Faoziyah & Ilham, 2024; World Bank, 2024).

From a behavioral economics perspective, the apparent stability in total carbohydrate consumption conceals an internal reconstruction of urban household diets. According to Bennett's Law, as urban society incomes rise and urbanization progresses, the expenditure share for starchy staples will gradually be replaced by foods rich in protein, vitamins, and minerals (Timmer, 2023). However, in the context of urban South Sulawesi, this transition does not immediately reduce the total volume of carbohydrates; instead, it alters the composition or types of carbohydrates on consumers' plates (Suryana, 2022). Massive urbanization in major cities like Makassar, Parepare, and Palopo has created a new consumer cluster that prioritizes practicality and flavor variety, thereby maintaining the total carbohydrate volume through cross-commodity substitution (Purwantini & Ariani, 2021).

Conceptually, this total trend analysis provides an essential foundation for the regional agribusiness system. The stable total demand volume suggests that the production and distribution capacity of energy-source foods in South Sulawesi must be maintained at a macro level (Dinas Ketahanan Pangan Sulsel, 2025). The inability to understand seasonal fluctuations in urban areas will impact the vulnerability of retail-level food price stability, which in turn can trigger regional inflation (Bank Indonesia, 2024). Therefore, the stability of this macro trend must be further dissected through partial commodity analysis to identify which food products are growing and which are losing market share in the urban ecosystem.

Trend of Rice Consumption in Urban South Sulawesi

As the primary staple food in Indonesia, rice exhibits highly interesting dynamics in urban South Sulawesi. The OLS linear trend estimation results for per capita rice consumption are presented through the following formula:

$$y = -0.0072x + 7.3273 \quad (R^2 = 0.2365)$$

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The intercept constant of 7.3273 confirms the absolute dominance of rice in the society's diet, with an initial volume reaching 7.3273 kg/capita/month. However, the directional coefficient (b = -0.0072) indicates a consistent and statistically significant downward trend. Every quarter, per capita rice consumption in urban areas shrinks by 0.0072 kg. The coefficient of determination (R^2) of 0.2365 indicates that quarterly time variation can explain approximately 23.65% of the total decline in rice consumption in these urban areas. This figure is considered high for single-commodity linear trend modeling based on secondary data, confirming that the de-escalation of rice consumption is not merely a random fluctuation but a long-term structural movement.

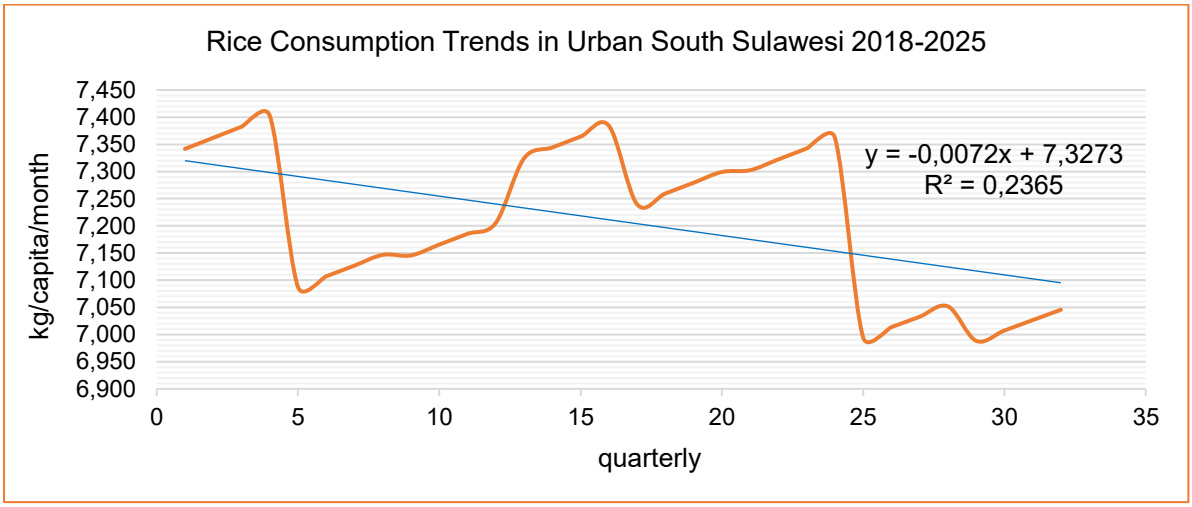


Figure 2. Rice Consumption Trends in Urban South Sulawesi 2018-2025

The decline in rice consumption in urban South Sulawesi reveals a spatial anomaly referred to as the Food Producing Center Paradox. South Sulawesi is historically and geopolitically a national rice surplus region with abundant production capacity (Kementerian Pertanian, 2024). However, geographical proximity to production centers apparently fails to stem the tide of "de-riceification" at the urban consumer level. Based on empirical graphs, the most extreme declines were seen in the 5th and 25th quarters, where consumption volume plummeted near 7.000 kg/capita/month and even touched a low of approximately 6.980 kg/capita/month. This sharp decline strongly correlates with the extreme El Nino climate phenomena in 2019 and 2023, which triggered crop failures,

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reduced supplies, and raised retail rice prices in urban areas beyond the government's Maximum Retail Price (HET) (Amare et al., 2024; Sayaka & Pasaribu, 2025).

Theoretically, this downward pattern aligns with Engel's Law, which states that as household income rises, the percentage of income allocated to buying staple foods (especially raw fresh foods like rice) will decrease because people begin to shift their budgets to non-food items or high-value processed foods (Clements et al., 2022). In urban South Sulawesi, the rise in the real income of the urban middle class is followed by changes in occupational structures, where more time is spent outside the home for professional activities (Rachman & Wardani, 2023). Cooking rice at home is considered time-inefficient for modern office workers. Consequently, there is a structural substitution toward out-of-home ready-to-eat meals, which are not always purely rice-based (Subroto & Hanani, 2024).

The agribusiness implications of this declining trend in urban rice consumption are massive for the sustainability of farming in rural South Sulawesi. The drop in local urban market absorption forces the South Sulawesi rice supply chain to rely increasingly on inter-island export markets, such as Kalimantan, Papua, and Maluku (Dinas Perdagangan Sulsel, 2025). If these inter-island markets face logistical barriers, the risk of stock accumulation in local rice milling warehouses will increase, potentially crashing grain prices at the farmer level (Saliem & Ariani, 2024). Therefore, rice agribusiness players in South Sulawesi can no longer rely on conventional marketing strategies; they must begin product diversification, such as producing premium small-packaged rice, organic rice, or low-glycemic functional rice to target health-conscious urban consumers (Simatupang, 2023).

Trend of Wheat Flour Consumption in Urban South Sulawesi

In stark contrast to rice, the trend of wheat flour consumption in the urban areas of South Sulawesi Province recorded consistent positive growth throughout the observation period. The OLS model yielded the following linear equation:

$$y = 0.596x + 357.93 \quad (R^2 = 0.0686)$$

This equation shows a baseline intercept value of 357.93 grams/capita/month with a positive slope coefficient of +0.596. This means that, on average, urban society's wheat flour consumption experiences an increase of 0.596 grams/capita/month in every observation quarter. The coefficient of determination (R^2) of 0.0686 indicates that the

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time-series factor contributes 6.86% to the upward pattern of wheat flour consumption. Although the R^2 value appears moderate, the consistently positive trend direction confirms that wheat and its derivative products are undergoing robust penetration into the urban food system in a national rice granary (Hardinsyah & Baliwati, 2023).

Observing the data visualization, the wheat flour consumption trend graph shows a highly significant volume leap, particularly in the 13th to 16th quarters, where consumption surged near 395 grams/capita/month. This period coincided with the post-COVID-19 economic recovery phase (around 2021-2022), where the micro, small, and medium enterprise (MSME) food and beverage (F&B) sector revived in urban areas (Mulyadi & Hidayat, 2024). The growth of modern bakery outlets, cafes, home-based baking industries, and the proliferation of wheat-based snacks (such as martabak, fritters, and toast) in Makassar's bustling centers serve as the primary catalysts driving the consumption volume of this commodity (Sudarsono & Wijaya, 2024).

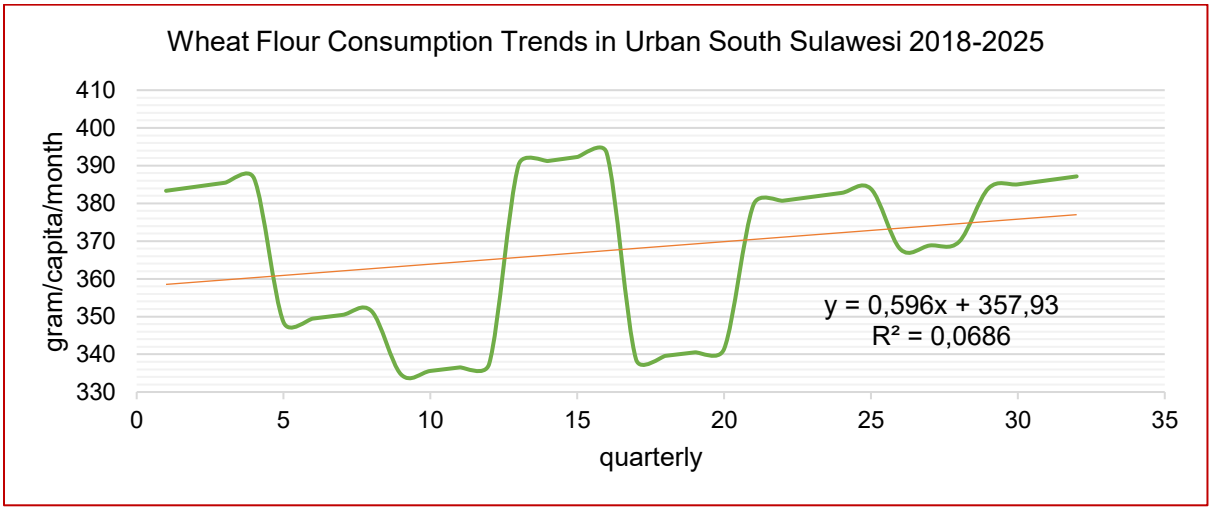


Figure 3. Wheat Flour Consumption Trends in Urban South Sulawesi 2018-2025

Theoretically, the expansion of wheat flour consumption in urban areas is a key indicator of the Nutrition Transition Theory proposed by Popkin (2020). This transition is marked by a dietary shift from traditional high-fiber, complex carbohydrate-rich foods to a Western diet characterized by high consumption of processed foods made from wheat, fats, and refined sugars (Popkin, 2020). A major driving factor for this phenomenon in urban South Sulawesi is the rise of the digital online food delivery ecosystem (e.g., GoFood, GrabFood, ShopeeFood) (Putri & Nugroho, 2025). The ease of ordering wheat-

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based foods anytime and anywhere changes urban snacking behavior, shifting from fresh local foods to processed wheat-based foods perceived as more fashionable and modern (Tarigan & Sinaga, 2024).

Viewed through the lens of global agribusiness supply chain management, the rise in wheat flour consumption in South Sulawesi's urban ecosystem carries crucial macro impacts. Indonesia, including South Sulawesi, lacks the climate suitability to produce wheat commercially; thus, the entire supply of pure wheat flour relies on imported wheat (Kementerian Perdagangan, 2025). The dependency of urban food systems shifting toward wheat flour will weaken regional food security from the perspective of food self-sufficiency, rendering local food supplies and prices highly vulnerable to Rupiah exchange rate fluctuations, export barrier policies of wheat-producing countries, and global geopolitical conflicts disrupting maritime logistics routes (Hermanto & Swastika, 2023).

Trend of Cassava Consumption in Urban South Sulawesi

Traditional local foods, represented by cassava, are experiencing severe marginalization pressure in the urban areas of South Sulawesi Province. Based on the OLS modeling results, the decline in cassava consumption is represented by the following linear equation:

$$y = -1.6498x + 310.7 \quad (R^2 = 0.0958)$$

The quantitative model above indicates an initial intercept of 310.7 grams/capita/month. The most concerning aspect is the large negative slope coefficient of -1.6498, meaning urban cassava consumption plummets sharply by 1.6498 grams/capita/month every observation quarter. The coefficient of determination (R^2) of 0.0958 proves that the linear time factor contributes 9.58% to the decline in demand volume for this commodity. This pattern demonstrates that non-rice local foods are increasingly sidelined from urban household daily menu preferences.

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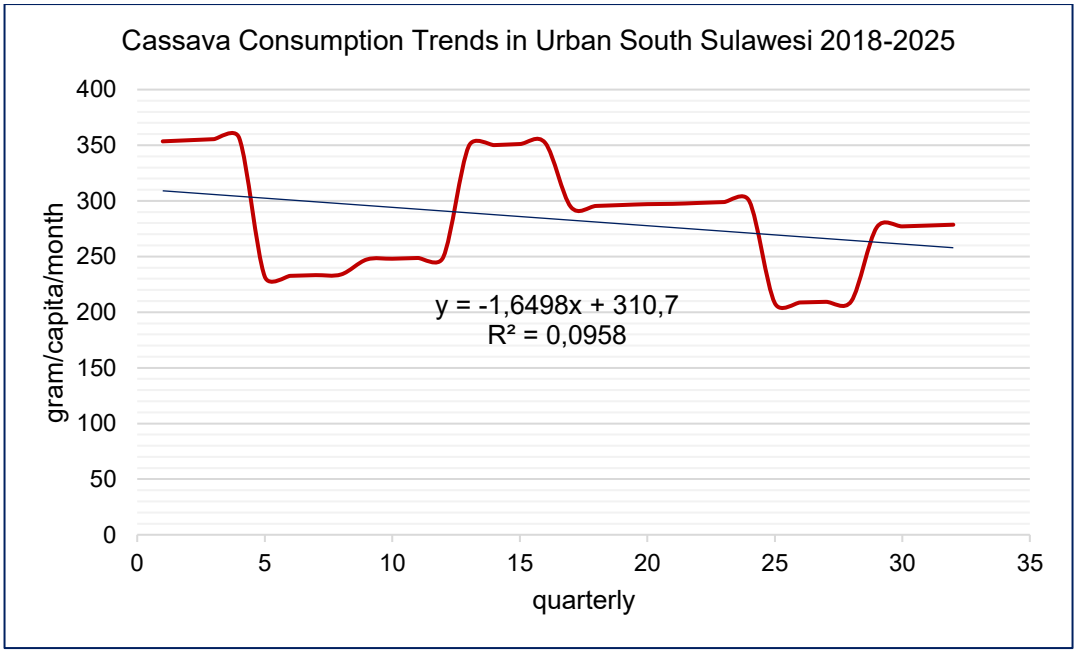


Figure 4. Cassava Consumption Trends in Urban South Sulawesi 2018-2025

Analysis of the empirical graphs shows drastic fluctuations but with a generally downward trend. Cassava consumption peaked above 350 grams/capita/month in the early periods but immediately dropped to extreme lows during the 5th to 12th quarters, falling below 250 grams/capita/month. Although brief seasonal rebounds occurred, consumption volume remained suppressed in the final observation quarters up to 2025. This sharp decline indicates a disruption in the downstream local food supply chain in urban areas. It is very rare to find modern markets or urban retailers providing fresh cassava with high standardized quality that is ready to cook, making it difficult for busy urban consumers to access this commodity (Hanafie & Suwarta, 2023).

Economically, cassava in urban areas is often categorized as an inferior good. Based on Consumer Demand Theory, inferior goods are commodities whose demand decreases significantly as the real per capita income of society increases (Varian, 2022). There is a social and psychological stigma attached in urban societies, where consuming cassava or tubers is often associated with the consumption patterns of the rural poor or as a symbol of food during times of crisis (Wibowo & Santoso, 2024). This declining factor is exacerbated by the lack of downstream agribusiness product innovation for cassava in South Sulawesi. Most cassava circulating in urban areas is still marketed in raw, whole

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forms that require a long time to peel, clean, and boil—a process actively avoided by time-constrained urban consumers (Ilham & Siregar, 2023).

The decline in cassava consumption in urban areas presents an irony for the national food diversification program initiated by the government (Badan Pangan Nasional, 2024). South Sulawesi possesses vast dryland potential for tuber cultivation, yet the inability to absorb harvests in local urban markets makes rural farmers reluctant to expand the scale of their cassava farming operations (Dinas Tanaman Pangan Sulsel, 2025). Efforts to revitalize local foods will not succeed if they solely focus on the upstream side (farmer production). Agribusiness technological interventions are required on the downstream side through the development of intermediate industries that convert cassava into high-quality Modified Cassava Flour (MOCAF), allowing it to be directly applied by urban baking and culinary industries as a partial substitute for imported wheat flour (Setyono & Utami, 2024).

Trend of Instant Noodle Consumption in Urban South Sulawesi

As one of the most popular processed food products in Indonesia, instant noodles present a unique and counterintuitive trend finding in urban South Sulawesi. Based on OLS linear regression analysis, the movement of instant noodle consumption is described by the following equation:

$$y = -1.3174x + 383.98 \quad (R^2 = 0.3706)$$

The initial intercept value of 383.98 grams/capita/month is the highest intercept among all non-rice carbohydrate commodities, demonstrating how strong instant noodles' position was as a primary alternative food choice in urban areas at the beginning of the research period. However, the slope coefficient shows a fairly large negative value of -1.3174, meaning there is a decline in instant noodle consumption of 1.3174 grams/capita/month per quarter. The most impressive aspect of this model is the coefficient of determination (R^2) reaching 0.3706. This value is the highest among the five estimated models, indicating that 37.06% of the variation in the decline of instant noodle consumption in urban areas is controlled by a strong and consistent linear time trend factor.

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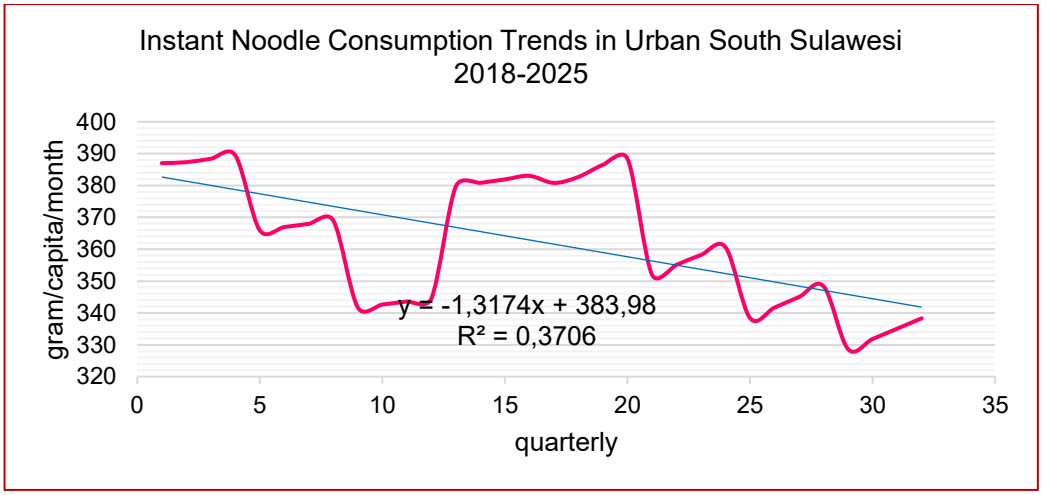


Figure 5. Instant Noodle Consumption Trends in Urban South Sulawesi 2018-2025

Looking at the graph's movement pattern, urban instant noodle consumption in South Sulawesi exhibits tight seasonal volatility with sharp upward and downward amplitudes. Consumption was at its highest near 390 grams/capita/month in several early and middle quarters (around the 4th and 20th quarters), but experienced a deep linear slump in the final quarters, reaching its lowest point near 328 grams/capita/month in the 29th quarter. This consistent decline contradicts the general assumption that instant noodle consumption in urban areas will always rise linearly in tandem with the busy activities of city dwellers.

The anomalous downward trend in instant noodles amidst the total rise in wheat flour trends can be explained through a combination of Consumer Behavior Theory and the Health Belief Model. Post-COVID-19 pandemic, a significant health paradigm shift occurred among the middle-to-upper economic class in urban South Sulawesi (Kusuma & Prasetyo, 2024). There has been a massive increase in nutritional literacy through social media campaigns regarding the dangers of excessive ultra-processed foods (UPF) consumption, where instant noodles are often accused of triggering various chronic metabolic diseases due to high sodium and preservative content (Sastro & Rahayu, 2025). Consequently, health-conscious urban consumer groups have begun voluntarily reducing their daily instant noodle consumption (Wahyudi & Utomo, 2024).

Although urban consumers are reducing instant noodle consumption for health reasons, their demand for convenience has not diminished. The consumption space left

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by instant noodles has shifted to non-instant wheat processed products deemed fresher and healthier (freshly made), such as locally made fresh noodles, premium pasta, whole wheat bread, or wheat-based culinary menus in modern restaurants (Gunawan & Setiawan, 2025). For the processed food agribusiness supply chain, this downward trend in instant noodles with a high R^2 serves as a strong indicator for food manufacturing corporations to immediately reformulate their products. Food agribusiness industry players must begin shifting their product portfolios toward healthier instant noodle variants, such as baked non-fried instant noodles, organic vegetable-based instant noodles, and gluten-free instant noodles to retain their market share, which has started to erode in urban South Sulawesi (Nugraha & Saputra, 2026).

CONCLUSION

This research concludes that a tangible structural food transition has occurred in the carbohydrate consumption patterns of the urban population in South Sulawesi Province throughout the 2018–2025 period. Although total carbohydrate consumption is relatively stable (y=-0.0009x+7.7576), there is significant substitution dynamics among commodities. Rice and cassava consumption experience a consistent downward trend, while demand for wheat flour shows positive growth. On the other hand, instant noodle consumption demonstrates a constant linear decline. This phenomenon confirms that urban modernization has shifted the staple food orientation from domestic-based toward imported commodities (wheat flour), driven by demands for practicality and shifts in urban consumers' health consciousness.

The South Sulawesi Provincial Government needs to reorient its food diversification programs. Local food campaigns can no longer present cassava or local commodities in their raw, fresh forms; instead, they must be promoted through downstream processing into local flours (such as mocaf or sago flour) capable of substituting the role of wheat flour in the urban creative bakery industry. Local rice producers and millers must begin adapting urban-oriented marketing strategies, for example, by providing small-sized ready-to-cook rice packaging (for small urban household portions) or specialty health rice (organic, low glycemic index) to capture upper-class market opportunities in urban areas.

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