

## Consumer Preferences and Market-driven Breeding Strategies for New Rice Varieties: A Case Study in an Giang Province, Vietnam

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### Abstract

As the rice sector in the Mekong Delta shifts its focus from quantity to quality, understanding the nuances of consumer demand is critical for developing value-added varieties. This study analyzes consumption habits and identifies key sensory traits required for market-driven breeding programs. Data were collected from 91 households in An Giang province in 2025 using a structured questionnaire. Statistical methods, including Chi-square tests, ANOVA, and Multivariate Logistic Regression, were employed to decipher market signals. The results reveal a distinct "Satisfaction Paradox": while 93.4% of consumers are satisfied with incumbent varieties (e.g., Dai Thom 8, ST25), 71.4% explicitly demand varietal improvements, indicating a state of "positive saturation". Regression analysis confirms that high-yield aromatic rice has become a standard expectation, whereas "Specialty Rice" consumption is the sole determinant of maximum satisfaction (Beta=0.92). Furthermore, a significant "Health Gap" was identified: 20.9% of consumers desire Low Glycemic Index (Low-GI) rice, yet only 3.3% use it due to palatability barriers. Consequently, the study proposes a breeding strategy prioritizing three objectives: (1) Visual appeal (translucent white grain) as the mandatory prerequisite for market entry; (2) Sensory fusion, integrating Low-GI traits into a soft, aromatic background to resolve the health-texture trade-off; and (3) Quality consistency to address consumer pain points. These findings serve as empirical inputs for biotechnologists to optimize breeding objectives aligned with modern market demand.

**Keywords:** Rice consumption, consumer preference, market-driven breeding, specialty rice, Low-GI rice, An Giang.

## 1. Introduction

The Mekong Delta (MKD) is facing critical challenges posed by climate change and sea-level rise. According to climate change scenarios, by the end of this century, rising sea levels could inundate large areas, directly impacting rice production (Ministry of Natural Resources and Environment, 2020). In An Giang province, the complex diversity of soil characteristics - ranging from acid sulfate soils and deep-flooded areas to saline-affected zones - necessitates rice varieties with high adaptability (Tran Kim Tinh et al., 2025).

In this context, Resolution 120/NQ-CP by the Government and Decision 287/QD-TTg by the Prime Minister have oriented the development of the Mekong Delta toward sustainable, climate-resilient agriculture (Government of Vietnam, 2017; Prime Minister, 2022). However, current production realities indicate that rice varieties are not yet clearly differentiated by ecological sub-regions, resulting in products that lack distinct identity and competitiveness (IRRI, 2021). The predominant rice varieties are currently cultivated mainly in areas with full dyke systems for flood control, while varieties capable of withstanding salinity and deep flooding remain limited (Ministry of Agriculture and Rural Development, 2020).

Although there have been research efforts regarding local rice farming models, the majority of previous studies have focused on agronomic technical aspects or the financial efficiency of these models. For instance, Le Quang Minh et al. (2012) focused on flood management, while Tran Ba Linh et al. (2021) compared the economic efficiency of various farming models. Recently, interest in indigenous floating rice varieties has increased, but studies have primarily evaluated agronomic adaptability (Nguyen Van Ket et al., 2021) without delving into quantitative analyses of consumer preferences for these varieties.

This research gap underscores the urgent need for assessments based on market signals. Consequently, this study aims to analyze consumer preferences and the factors influencing the demand for rice variety improvement, thereby contributing to the empirical database for climate-resilient breeding strategies in An Giang (World Bank, 2020). The study pursues two main objectives: (1) To determine the importance and hierarchy of rice attributes in the context of modern consumption; and (2) To forecast the demand for varietal improvement, providing scientific input for breeding programs serving the restructuring of the provincial rice sector. Unlike previous studies that have primarily focused on agronomic performance, production efficiency, or environmental adaptability of rice varieties, this study adopts a market-oriented perspective by incorporating consumer preferences into breeding strategies. The novelty of this research lies in three aspects. First, it identifies and prioritizes the rice attributes that consumers expect from future varieties, providing direct market signals for breeding programs. Second, it combines descriptive analysis with multiple linear regression and binary logistic regression to explain both consumer satisfaction and the demand for varietal improvement. Third, the study reveals a "satisfaction paradox," whereby consumers report high satisfaction with existing rice varieties while simultaneously expressing a strong demand for further improvement. These

findings contribute to the emerging literature on consumer-oriented rice breeding and provide practical evidence for aligning breeding objectives with evolving market demand.

## **2. Research methodology**

### *2.1. Research Design and Sampling*

This study adopted a cross-sectional quantitative research design to investigate household preferences for rice varieties and the demand for future breeding improvements. Primary data were collected through face-to-face interviews using a structured questionnaire between July and October 2025 in An Giang Province, Vietnam. Face-to-face interviews were selected because rice purchasing decisions are often made collectively within households, and this approach helped minimize item non-response while improving data accuracy.

The target population consisted of household members primarily responsible for purchasing rice for daily consumption. Respondents had to satisfy two inclusion criteria: (1) being at least 18 years old, and (2) being directly involved in household rice purchasing decisions.

The questionnaire was developed based on previous studies on rice consumption behaviour and consumer preference, with necessary modifications to suit the Vietnamese context. Prior to the formal survey, the questionnaire was pre-tested with 15 consumers to improve wording clarity and ensure content validity.

The final questionnaire consisted of four sections. The first section collected respondents' demographic characteristics. The second examined household rice purchasing behaviour and consumption patterns. The third evaluated purchasing criteria and satisfaction with currently consumed rice varieties using five-point Likert scales (1 = strongly disagree/very unimportant to 5 = strongly agree/very important). The final section investigated consumers' demand for rice variety improvement and preferred characteristics for future breeding.

A stratified convenience sampling method was implemented based on residential characteristics to ensure representativeness for two consumer ecological regions: Rural (including communes in Chau Thanh, Thoai Son, and Tri Ton districts) and Urban (Long Xuyen City and Rach Gia City). The minimum sample size was determined according to Green's (1991); Tabachnick and Fidell (2007) rule of thumb for regression analysis ( $n \geq 50 + 8m$ ). With the proposed model including 05 independent variables (Quality, Price, Convenience, Safety, and Brand), the minimum required sample size was 90. The actual result yielded 91 valid observations ( $n=91$ ) after data cleaning, satisfying the statistical conditions to perform inferential tests and multivariate analysis.

Table 1. Characteristics of the survey sample

| Characteristics  | Category                      | Frequency (n) | Percentage (%) |
|------------------|-------------------------------|---------------|----------------|
| Residential Area | Rural                         | 51            | 56.0           |
|                  | Urban                         | 40            | 44.0           |
| Gender           | Male                          | 30            | 33.0           |
|                  | Female                        | 61            | 67.0           |
| Age Group        | Under 28 years old            | 13            | 14.3           |
|                  | From 29 - 44 years old        | 34            | 37.4           |
|                  | Over 45 years old             | 44            | 48.3           |
| Education Level  | Primary & Lower Secondary     | 28            | 30.8           |
|                  | Upper Secondary (High School) | 35            | 38.5           |
|                  | College/University or higher  | 28            | 30.8           |
| Occupation       | Farmer                        | 22            | 24.2           |
|                  | Trader/Business               | 25            | 27.5           |
|                  | Homemaker                     | 18            | 19.8           |
|                  | Civil Servant/Public Official | 15            | 16.5           |
|                  | Others (Freelancer/Worker)    | 11            | 12.1           |
| Total            |                               | 91            | 100.0          |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

The descriptive statistics presented in Table 1 confirm the representativeness and reliability of the survey sample (n=91) for subsequent analyses. Geographically, the distribution between rural (56.0%) and urban (44.0%) areas is relatively balanced, facilitating comparisons of consumption behaviors across different ecological zones.

Regarding demographics, females constitute the majority (67.0%), doubling the male proportion. This distribution accurately reflects the cultural reality in Vietnam, where women typically act as the primary "gatekeepers" for household food purchasing. The age structure is diverse, dominated by the over-45 (48.3%) and 29-44 (37.4%) groups, thereby capturing the perspectives of key household decision-makers. In terms of occupation, Traders (27.5%) and Farmers (24.2%) account for the largest shares. Notably, the significant presence of farmers provides valuable insights from a group possessing practical expertise in rice varieties.

## 2.2. Data Analysis Methods

Data were processed using specialized statistical software through two main analysis stages:

### **Descriptive Statistical Analysis and Difference Testing:**

Descriptive statistics (frequency, percentage, Mean, SD) were used to outline consumer profiles and the current status of rice consumption. Additionally, inferential statistical tests were applied to evaluate variations in consumer behavior, including:

- *Chi-square test*: To assess the association between categorical variables such as residential area and the type of rice consumed.
- *T-test and ANOVA*: To compare differences in satisfaction levels and purchasing criteria among groups (categorized by region, age, and rice variety used).

### **Regression Analysis:**

- *Multiple Linear Regression*: Used to identify factors influencing overall consumer satisfaction.
- *Binary Logistic Regression*: Established to predict the probability of a household having a demand for rice variety improvement ( $Y=1$ : Demand exists;  $Y=0$ : No demand). Following the guidelines of Hosmer, Lemeshow, and Sturdivant (2013), this method was selected as the optimal approach for modeling dichotomous dependent variables. It allows for the identification of key drivers and, crucially, quantifies the strength of impact through Odds Ratios (OR), providing a clear interpretation of how specific factors (e.g., consumption difficulties) increase the likelihood of demanding new varieties.

## **3. Results and discussion**

### *3.1. Household rice consumption behavior and trends*

Statistical analysis reveals a significant structural transition in the An Giang rice market, shifting from quantity-oriented consumption ("eating enough") to quality-oriented consumption ("eating well"). While the High-yield Aromatic Rice group (e.g., Dai Thom 8, Jasmine 85) retains a dominant position, serving as the market's "common denominator" with a 44.0% share, value growth drivers are noticeably migrating toward the premium segment.

The most notable finding is the emergence of the Specialty Rice group (ST24, ST25), which now accounts for 16.5% of the total market share. However, in-depth analysis using Pearson's Chi-square test indicates that this distribution is not uniform but heavily influenced by geographical factors ( $\text{Sig.} = 0.025 < 0.05$ ). Specifically:

- **Urban Areas**: Act as the stronghold of premium consumption. The usage rate of Specialty Rice here reaches 27.5%, approximately 3.5 times higher than in rural areas (7.8%). This reflects a

"hedonic consumption" behavior driven by higher disposable incomes and better access to modern retail channels.

- Rural Areas: Tend to preserve traditional values. The Local Seasonal/Traditional Rice group (e.g., Nang Tay Dum, Soc) retains a significant market share of 19.6%, whereas this figure drops to only 5.0% in urban settings. This suggests a persistent preference for the robust, natural flavor of long-duration varieties among rural communities.

This segmentation (as shown in **Table 2**) implies that breeding strategies should adopt a "multi-targeted" approach: optimizing high-quality sensory traits (aroma, softness) for the urban segment while maintaining traditional flavor profiles for the rural market.

Table 2. Market share structure and geographical segmentation of rice varieties

| Rice Category                                                            | Overall Share<br>(n=91) | Distribution by Area |                 | Chi-square<br>Sig. |
|--------------------------------------------------------------------------|-------------------------|----------------------|-----------------|--------------------|
|                                                                          |                         | Urban<br>(n=40)      | Rural<br>(n=51) |                    |
| <b>High-yield Aromatic</b><br>( <i>Dai Thom 8, Jasmine 85, etc.</i> )    | 44.0%                   | 45.0%                | 43.1%           | 0.856              |
| <b>Specialty Rice</b><br>( <i>ST24, ST25</i> )                           | 16.5%                   | 27.5%                | 7.8%            | 0.012**            |
| <b>Traditional / Seasonal Rice</b><br>( <i>Nang Tay Dum, Soc, etc.</i> ) | 13.2%                   | 5.0%                 | 19.6%           | 0.038**            |
| <b>Common / Others</b><br>( <i>OM18, IR50404, Mixed rice</i> )           | 26.3%                   | 22.5%                | 29.4%           | 0.460              |
| <b>Total</b>                                                             | 100.0%                  | 100.0%               | 100.0%          |                    |

Note: (\*\*) Difference is statistically significant at the 0.05 level

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

The hierarchy of purchasing criteria presented in **Table 3** reveals a distinct consumer mindset regarding rice as an essential commodity in An Giang.

First, the absolute dominance of Intrinsic Values: The top-ranked criteria are Taste Preference (Mean = 4.34) and Sensory Quality (Mean = 4.21). The low standard deviation (SD = 0.77) indicates a high consensus among consumers: for rice, the actual eating experience (texture, aroma) is non-negotiable. Taste acts as the primary "gatekeeper" - if the sensory attributes fail to satisfy, all other factors become irrelevant. Theoretically, this finding supports the concept that intrinsic product attributes remain the primary determinants of consumer food choice. According to food choice theory, sensory characteristics such as taste and texture constitute experiential attributes that consumers can only fully evaluate after consumption, thereby exerting a stronger

influence on repeat purchase behaviour than extrinsic cues such as brand or packaging. The results therefore reinforce previous evidence that consumers perceive rice primarily as an experiential food product rather than a branded commodity.

Second, the "Brand Paradox": A critical and debate-worthy finding is the significantly low ranking of Brand Name (Mean = 2.91 - below average), placing it last among all criteria. While consumers are increasingly willing to pay premiums for high-quality varieties (e.g., ST25), they show minimal concern for the specific corporate brand producing it.

This suggests that the domestic rice market still operates largely on a "Commodity" mindset. Consumers tend to associate "brand" with the rice variety name (e.g., ST25, Dai Thom 8) or the reputation of the retailer, rather than exhibiting loyalty to corporate brands. This disconnect represents a substantial "value gap" that agribusinesses must bridge to establish sustainable brand equity.

Table 3. Hierarchy of rice purchasing criteria by factor groups

| Factor Group                               | Purchasing Criteria                        | Mean | SD   | Rank |
|--------------------------------------------|--------------------------------------------|------|------|------|
| <b>Core Values (Intrinsic Attributes)</b>  | Taste Preference                           | 4.34 | 0.77 | 1    |
|                                            | Sensory Quality ( <i>Softness, Aroma</i> ) | 4.21 | 0.68 | 2    |
|                                            | Food Safety                                | 4.15 | 0.81 | 3    |
| <b>Added Values (Extrinsic Attributes)</b> | Reasonable Price                           | 4.00 | 0.71 | 4    |
|                                            | Packaging / Origin                         | 3.85 | 0.83 | 5    |
|                                            | Brand Name                                 | 2.91 | 0.94 | 6    |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

The Independent Samples T-test results (**Table 4**) reveal a market landscape characterized by both shared values and distinct behavioral divergences between rural and urban consumers.

- The "Stockpiling" Gap (Logistics & Lifestyle):

The most statistically significant difference ( $p = 0.003$ ) lies in the Average Purchase Volume. Rural households exhibit a "stockpiling behavior," purchasing an average of 30.15 kg/time, nearly 50% more than urban households (21.13 kg/time).

- *Root Cause*: This reflects rural lifestyle characteristics: multi-generational families, higher frequency of home cooking (3 meals/day), and greater distance to markets.
- *Urban Contrast*: Urban consumers, constrained by limited storage space (apartments) and a convenience-oriented lifestyle, prefer smaller, more frequent purchases to ensure freshness.

- The "Sophistication" Gap (Sensory Demands):

Urban consumers are significantly more demanding regarding specific product attributes. They rate Sensory Attributes (Aroma/Texture) and Suitability for Purpose significantly higher than



their rural counterparts ( $p < 0.05$ ). This indicates that urban rice consumption has evolved from "sustenance" to "culinary experience," requiring specialized rice for specific dishes (e.g., sushi, porridge, clay pot rice).

- The "Core Value" Consensus:

Interestingly, there is no statistical difference regarding Price Sensitivity, General Quality, and Packaging/Origin ( $p > 0.05$ ). Both groups rate these factors as "Important" ( $\sim 4.0/5.0$ ). This suggests that basic quality and safety have become "Hygiene Factors" - universal standards expected by all consumers regardless of location.

- The "Brand" Latency:

Although the difference in Brand Reputation is not statistically significant ( $p = 0.351$ ) due to high variance, a "latent gap" is visible in the mean scores: Urban (3.50 - Important) vs. Rural (2.78 - Below Average). Brand awareness is emerging in cities, while rural areas still rely heavily on "interpersonal trust" with local retailers.

Table 4. Comparison of purchasing criteria and behavior: Rural vs. Urban

| Criteria / Behavior                             | Rural Mean<br>(n=51) | Urban<br>Mean<br>(n=40) | Mean<br>Diff. | t-value | Sig.     | Conclusion  |
|-------------------------------------------------|----------------------|-------------------------|---------------|---------|----------|-------------|
| Avg. Purchase Volume (kg)                       | 30.15                | 21.13                   | +9.02         | 3.05    | 0.003*** | Significant |
| Concern: Sensory Attributes<br>(Aroma, Texture) | 4.16                 | 4.55                    | -0.39         | -2.48   | 0.015**  | Significant |
| Concern: Suitability<br>(Fit for purpose)       | 3.85                 | 4.55                    | -0.70         | -3.08   | 0.004*** | Significant |
| Concern: Price                                  | 3.87                 | 4.15                    | -0.28         | -1.54   | 0.130    | Not Sig.    |
| Concern: Quality                                | 4.16                 | 4.33                    | -0.17         | -0.80   | 0.433    | Not Sig.    |
| Concern: Packaging/Origin                       | 3.86                 | 4.24                    | -0.38         | -1.45   | 0.159    | Not Sig.    |
| Concern: Brand Name                             | 2.78                 | 3.50                    | -0.72         | -1.21   | 0.351    | Not Sig.    |

Note: (\*\*) (\*\*\*) respectively at significance levels of 0.05; 0.01

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

Based on these findings, a "One-size-fits-all" strategy is ineffective. A dual approach is recommended:



Table 5. Strategic Implications (Tailored Strategy)

| Strategy          | Rural Market<br>(The Volume Strategy) | Urban Market<br>(The Premium Strategy) |
|-------------------|---------------------------------------|----------------------------------------|
| Packaging Size    | Bulk Packs (25kg - 50kg)              | Small Packs (5kg - 10kg)               |
| Material          | Durable Woven PP (Cost-effective)     | PA/PE Vacuum Bag (Premium look)        |
| Value Proposition | "Economical & Satiating"              | "Aromatic, Soft & Specialized"         |
| Distribution      | Traditional Rice Depots / Wet Markets | Modern Retail / Convenience Stores     |

Source: Author's suggestion

Data presented in **Table 6** serves as a critical proxy for consumer satisfaction, revealing how households actively modify products to suit their preferences.

First, while single-variety consumption dominates (69.2%), a significant segment of 30.8% of households persists in manual rice blending. This suggests a "quality gap" where existing single varieties - despite their popularity - fail to fully satisfy the sensory requirements of nearly one-third of the market.

Second, consumers are effectively acting as "Home-based Breeders." They do not blend varieties randomly but follow specific formulas to engineer their desired sensory profile. The average proportion of the primary rice variety is 71.1%, with two "Golden Ratios" identified:

- The 7:3 Ratio (Dominant): Typically combines 70% Aromatic/Sticky rice (for flavor and softness) with 30% Fluffy/Dry rice (for structural integrity). This reflects a sophisticated effort to balance Stickiness and Fluffiness, creating a texture that is neither too glutinous nor too dry.
  - The 1:1 Ratio: Often used to balance opposing traits or to optimize household food costs.
- Implication for Breeding: The persistence of this 30.8% "blending segment" highlights a clear market opportunity. Instead of pursuing extreme traits (e.g., extremely sticky or extremely aromatic), breeding programs should prioritize "Intermediate/Balanced Traits." Developing a single "All-in-one" variety that mimics the 7:3 texture profile (medium plasticity, non-sticky surface) would resolve the consumer's inconvenience of manual mixing and capture this specific market segment.

Table 6. Consumer rice blending behavior and ratios

| Statistical Indicator  | Value             | Interpretation / Explanation                                                                 |
|------------------------|-------------------|----------------------------------------------------------------------------------------------|
| Households Mixing Rice | 28 (30.8%)        | Represents the "Unsatisfied Segment" seeking better texture balance.                         |
| Households Not Mixing  | 63 (69.2%)        | Represents the segment satisfied with current single varieties.                              |
| Average Mixing Ratio   | 71.1%             | Calculated based on the proportion of the primary rice variety.                              |
| Common Ratios"         | "Golden 7:3 & 1:1 | 7:3: Balancing texture (Softness vs. Fluffiness).<br>1:1: Balancing cost or opposing traits. |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

Data in **Table 7** outlines the sensory standards that currently define consumer acceptance in An Giang. These figures serve as crucial technical specifications for breeding programs.

- Convenience as the Prerequisite (The "Hygiene Factor"): The attribute "Easy to cook" holds the absolute majority preference (82.4%). This confirms that modern consumers, constrained by busy urban lifestyles, no longer tolerate varieties that require complex preparation (e.g., soaking, precise water measuring). Consequently, "cooking stability" must be treated as a non-negotiable minimum requirement for any new variety.
- The Definition of "Delicious": Soft and Aromatic: "Soft texture" (58.2%) and "Aroma" (57.1%) emerge as the twin pillars of quality. Their nearly identical approval ratings suggest that these traits are inseparable in the consumer's perception of premium rice. This explains the current market dominance of the High-yield Aromatic group (Dai Thom 8) and Specialty group (ST25), which successfully integrate both traits.
- The Texture Polarization: The 40/40 Split: A critical finding is the deep market division regarding texture preferences:
  - The "Fluffy/Dry" Camp (40.7%): Consumers who prefer rice that separates easily and is not sticky. This group typically includes older generations, manual laborers, and rural residents who value rice that is "filling" and pairs well with soup.
  - The "Sticky/Glutinous" Camp (39.6%): Consumers who prefer cohesive, sticky grains, typical of the younger demographic and office workers.
- The Rejection of "Hardness": Only 15.4% of consumers accept "Hard texture." This indicates that the era of hard/dry rice is ending for household consumption, being relegated solely to food processing (e.g., rice noodles) or the low-income segment.

Table 7. Sensory attributes of currently consumed rice

| Sensory Attribute | Frequency (n) | Percentage (%) | Market Implication            |
|-------------------|---------------|----------------|-------------------------------|
| Easy to cook      | 75            | 82.4           | Prerequisite (Standard)       |
| Soft texture      | 53            | 58.2           | Key Driver of Satisfaction    |
| Aromatic          | 52            | 57.1           | Key Driver of Satisfaction    |
| Dry / Fluffy      | 37            | 40.7           | Segment A (Traditional/Rural) |
| Sticky            | 36            | 39.6           | Segment B (Modern/Urban)      |
| Hard texture      | 14            | 15.4           | Niche / Declining             |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

The Chi-square analysis reveals a multidimensional demand landscape where Generation acts as a decisive discriminator ( $p = 0.020$ ), whereas Geography shows surprising convergence ( $p = 0.658$ ).

- The data indicates a non-linear relationship between age and demand, forming a distinct "U-shaped" curve:

- Gen X+ (>45 years) - The Therapeutic Segment: Exhibits the highest demand (31.8%). This is driven by the physiological reality of aging and the onset of metabolic risks (diabetes, hypertension). For this group, Low-GI rice is a "Need-based" product for disease management.
- Gen Z (<28 years) - The Lifestyle Segment: Surprisingly holds the second-highest demand (23.1%). Unlike the older demographic, their motivation stems from "Wellness & Aesthetics" trends (e.g., weight control, clean eating). They perceive Low-GI rice as a preventive and lifestyle choice.
- Gen Y (29-44 years) - The Indifferent Gap: Interest drops significantly to 5.9%. This "dip" may be attributed to an "Optimism Bias" regarding their current health status, prioritizing other life pressures over personal preventative nutrition.

- Debunking the Urban Myth: The statistical result ( $p > 0.05$ ) refutes the common assumption that functional rice is an "urban luxury."

- Notably, the latent demand in Rural areas (23.5%) nominally exceeds that of Urban areas (17.5%).
- This reflects the rapid aging of the rural population and the universal prevalence of non-communicable diseases. This suggests that the rural market represents a "Blue Ocean" for affordable functional rice products.

Table 8. Demand for Low-GI rice by Generation and Geography

| Category      | Group         | Demand (%) | Rate Chi-square Sig. | Interpretation                    |
|---------------|---------------|------------|----------------------|-----------------------------------|
| By Generation | Gen Z (<28)   | 23.1%      | <b>0.020**</b>       | Lifestyle Segment (High)          |
|               | Gen Y (29-44) | 5.9%       |                      | Indifferent Segment (Low)         |
|               | Gen X+ (>45)  | 31.8%      |                      | Therapeutic Segment (High)        |
| By Geography  | Rural         | 23.5%      | 0.658                | High Potential (Aging population) |
|               | Urban         | 17.5%      |                      | Moderate Potential                |

Note: (\*\*) Difference is statistically significant at the 0.05 level

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

Although the Chi-square results (**Table 9**) do not show statistical significance ( $p > 0.05$ ), the descriptive data reveals critical trends for targeting strategies:

- The Dominance of Gen Y (The "Sandwich" Generation):

Gen Y (29-44 years old) exhibits the highest demand for safe rice (50.0%). As the primary caregivers for both young children and aging parents, this group acts as the household's "Safety Gatekeeper." They are less price-sensitive and more safety-conscious compared to Gen Z (lifestyle-driven) and Gen X+ (tradition-driven).

- The Rural-Urban Trust Gap:

Contrary to the assumption that safe food is an urban luxury, demand in Rural areas (49.0%) nominally exceeds that in Urban areas (30.0%). This stems from "Producer's Awareness" - farmers are acutely aware of agrochemical risks and prefer self-grown or trusted local rice. Conversely, urban consumers face a "Trust Deficit," leading to skepticism towards market-labeled "clean rice" despite having higher purchasing power.

Marketing campaigns for Safe Rice should primarily target Gen Y parents with messages focused on "Child Safety," while distribution strategies must address the "Trust Deficit" in urban markets through transparent traceability (QR codes/Origin tracking).

Table 9. Demand for "Safe/Clean Rice" by Generation and Geography

| Demographic Category | Group         | Interest Rate (%) | Usage / Chi-square Sig. | Market Implication               |
|----------------------|---------------|-------------------|-------------------------|----------------------------------|
| By Generation        | Gen Z (<28)   | 30.8%             | 0.351                   | Moderate Interest                |
|                      | Gen Y (29-44) | 50.0%             |                         | Core Audience (Parenting Stage)  |
|                      | Gen X+ (>45)  | 36.4%             |                         | Traditional Buyers               |
| By Geography         | Rural         | 49.0%             | 0.106                   | High Demand (Producer Awareness) |
|                      | Urban         | 30.0%             |                         | Trust Barrier exists             |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

The consolidated data in **Table 10** reveals a distribution landscape characterized by the overwhelming dominance of traditional channels and a stark structural division between rural and urban markets.

- The Absolute Dominance of Traditional Trade: The market is fundamentally driven by proximity and personal interaction. Specialized Rice Depots (30.3%) and Local Grocery Stores (22.0%) collectively control the majority of the commercial market.
- *Consumer Insight:* Shoppers prioritize the ability to physically inspect the rice (loose rice) and the convenience of nearby locations. The "Rice Depot" acts as the primary hub for variety and price flexibility.
- The "Self-Sufficiency" Wall (Rural-Urban Polarization): The most critical finding is the structural split caused by "Home-grown Rice" ( $p = 0.000$ ).
- Rural Market: Functioning as a semi-closed market where 58.8% of households are self-sufficient producers. This drastically reduces the addressable commercial market size in rural areas.
- Urban Market: A fully commercialized environment where self-sufficiency is non-existent (0.0%). Urban consumers are entirely dependent on retail networks, with 60.0% relying on Rice Depots and 40.0% on Local Groceries.
- The Limited Role of Modern Trade: Supermarkets hold a modest overall share of 5.5%. While they have gained some traction in urban areas (12.5% usage), they remain a niche channel compared to the ubiquity of traditional trade. Furthermore, Online channels are completely absent (0.0%), confirming that digital disruption has not yet reached the rice staple sector due to logistics and trust barriers

Based on this segmented landscape, the distribution strategy must be bifurcated:

- Urban Strategy ("Win at the Depot"):

- Since 60% of urbanites buy from depots and 40% from groceries, resources must be focused here.
- Action: Transform depot owners into "Brand Ambassadors." Because urbanites rely on seller recommendations, trade marketing (incentives, signage) at these locations is more effective than supermarket listings.

- Rural Strategy ("Niche Penetration"):

- With 58.8% of the population eating home-grown rice, selling standard rice is futile.
- Action: Target the rural market only with Specialty Varieties (e.g., ST25, distinct hybrids) that farmers cannot grow themselves. Position these products as "Premium Treats" for special occasions or gifts, bypassing the daily staple competition

Table 10. Distribution channels reaching consumers

| Distribution Channel     | Overall Market Share (n=91) | Rural Usage (n=51) | Urban Usage (n=40) | Chi-square Sig. | Market Insight                                   |
|--------------------------|-----------------------------|--------------------|--------------------|-----------------|--------------------------------------------------|
| Specialized Rice Depot   | 30.3%                       | 17.6%              | 60.0%              | <b>0.000***</b> | Urban Dominant Key channel for variety & advice. |
| Home-grown / Self-supply | 27.5%                       | 58.8%              | 0.0%               | <b>0.000***</b> | Rural Exclusive Major barrier to entry.          |
| Local Grocery Store      | 22.0%                       | 15.7%              | 40.0%              | <b>0.018**</b>  | Urban Preferred Driven by convenience.           |
| From Acquaintances       | 10.1%                       | 13.7%              | 10.0%              | 0.828           | Trust-based sourcing.                            |
| Supermarket              | 5.5%                        | 2.0%               | 12.5%              | 0.113           | Niche Modern Trade.                              |
| Online                   | -                           | -                  | -                  | -               | No Penetration.                                  |

Note: (\*\*) (\*\*\*) respectively at significance levels of 0.05; 0.01

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

### 3.2 Household satisfaction with the type of rice they are consuming

Data from **Table 11** reveals that the An Giang rice market has entered a state of "Positive Saturation."

- The "Zero Defect" Baseline: The combined dissatisfaction rate ("Dissatisfied" + "Very Dissatisfied") is 0.0%. This confirms that current market varieties (Dai Thom 8, OM18) have successfully established a high quality baseline. New varieties cannot compete by "fixing defects" (since consumers perceive none). They must compete by "Adding Value" to break the status quo.
- The "Satisfied" Majority vs. The "Loyalty" Gap: While 57.1% of consumers are "Satisfied" (Score 4/5), marketing theory suggests this group is stable but not necessarily loyal. The most accessible entry point for new varieties is the 17.6% "Average" segment - consumers whose sophisticated palates or specific needs are not fully met by current offerings.

Table 11. Overall Consumer Satisfaction Levels

| Satisfaction Level    | Frequency (n) | Percentage (%) | Market Insight                             |
|-----------------------|---------------|----------------|--------------------------------------------|
| 1 - Very Dissatisfied | 0             | 0.0%           | "Zero Defect" Market                       |
| 2 - Dissatisfied      | 0             | 0.0%           | High baseline quality.                     |
| 3 - Average / Neutral | 16            | 17.6%          | Target Gap: Entry point for new varieties. |
| 4 - Satisfied         | 52            | 57.1%          | Stable but susceptible to switching.       |
| 5 - Very Satisfied    | 23            | 25.3%          | Premium segment (Hard to convert).         |
| <b>Total</b>          | <b>91</b>     | <b>100.0%</b>  | <b>Mean Score: 4.08</b>                    |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

To determine if satisfaction varies by rice type, an ANOVA test was conducted (**Table 12**). The result ( $F = 12.07$ ,  $p < 0.001$ ) confirms a statistically significant difference, validating the existence of a "Quality Hierarchy." However, the Post-hoc Tukey analysis reveals a critical market paradox:

- The "Specialty" Supremacy: Specialty Rice (ST25, Seasonal Rice) stands in a league of its own with a near-perfect mean score of 4.82/5.00 ( $SD=0.40$ ). This confirms that specialty traits (superior aroma, perfect texture) are the only drivers capable of pushing satisfaction to the "Delight" level.
- The "Aromatic" Commoditization: Crucially, there is no statistically significant difference ( $p > 0.05$ ) in satisfaction between High-yield Aromatic Rice (Mean = 3.90) and Common Rice (Mean = 3.84). Aromatic traits (softness, mild fragrance) have become the "New Normal."



Consumers no longer perceive standard aromatic rice as a value-added product; it has become a commodity expectation.

The strategy of shifting production from Common to Aromatic rice yields diminishing returns in consumer perception. The future strategy must be a "Quantum Leap" targeting the Specialty standard (Score > 4.5) to create genuine value differentiation.

Table 12. Satisfaction Differences by Rice Category (ANOVA & Mean Comparison)

| Rice Category                             | N  | Mean Score        | SD   | ANOVA Result              | Conclusion                                |
|-------------------------------------------|----|-------------------|------|---------------------------|-------------------------------------------|
| 1. Specialty Rice (ST25, Seasonal)        | 11 | 4.82 <sup>a</sup> | 0.40 | F = 12.07<br>Sig. = 0.000 | "Delight" Level<br>(Significantly Higher) |
| 2. High-yield Aromatic (Dai Thom 8, OM18) | 30 | 3.90 <sup>b</sup> | 0.66 |                           | "New Normal"<br>(No diff. from Common)    |
| 3. Common / Dry Rice (IR504, Ham Chau)    | 19 | 3.84 <sup>b</sup> | 0.50 |                           | "Basic" Level                             |

Note: Means with different superscripts (a, b) differ significantly at  $p < 0.05$  based on Tukey HSD post-hoc test. The ANOVA analysis was conducted on a subsample of  $n=60$  households with clearly identified rice varieties. Households consuming mixed rice (blends), broken rice, or unidentified varieties ( $n=31$ ) were excluded to ensure group homogeneity and comparative validity.

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

To isolate the specific factors driving consumer satisfaction (Y), a Linear Regression model was established. The model achieved an  $R^2$  of 0.341, indicating that it explains 34.1% of the variance in satisfaction - a robust level for behavioral science research. The results in **Table 13** reveal three critical market insights.

- Specialty Rice: The Sole Determinant of "Satisfaction". Among all independent variables, "Usage of Specialty Rice" is the *only* statistically significant predictor ( $p = 0.000$ ), possessing a massive positive coefficient (Beta = +0.92). From a theoretical perspective, the finding extends Kano's quality model by suggesting that high-yield aromatic rice has evolved from an attractive attribute into a basic expectation among Vietnamese consumers. Aroma is therefore no longer sufficient to create competitive differentiation. Instead, specialty characteristics generate delight and significantly improve satisfaction.

- This finding provides unequivocal evidence: Switching a household from Common Rice to Specialty Rice (e.g., ST25, Seasonal Rice) propels their overall satisfaction by nearly 1.0 full point on a 5-point scale. This represents a "quantum leap" in experiential quality. Specialty Rice is effectively identified as the singular key to unlocking peak customer satisfaction.

- The "Normalization" Trap of Aromatic Rice: A startling and cautionary finding is that "Usage of Aromatic Rice" has a negligible coefficient (Beta = +0.07) and holds no statistical significance ( $p = 0.713$ ). *Kano Model Perspective*: This suggests that high-yield aromatic varieties (e.g., Dai Thom 8, OM18) have transitioned from being "Delighters" to "Must-be" attributes (Kano et al., 1984). Similar to previous studies in the Philippines and Vietnam (Cuevas et al., 2016; Custodio et al., 2019), as incomes increase, Southeast Asian consumers default to believing that good rice must be fragrant and soft. Therefore, current high-yield fragrant rice varieties only meet the minimum acceptance threshold and no longer create a distinct competitive advantage. Consumers now perceive aroma and softness as default standards ("New Normal"). Consequently, consuming standard aromatic rice no longer yields a marginal increase in satisfaction - the market has reached an "Emotional Saturation" point for this category.
- The Expectation Paradox: Interestingly, variables related to "Level of Concern" (Quality, Packaging, Price) exhibit negative coefficients (though insignificant).
- This aligns with the theory that highly concerned consumers possess higher pre-purchase expectations. When expectations are elevated, the "disconfirmation gap" narrows, making it harder for the product to satisfy them compared to easy-going consumers. This finding aligns with the Expectation Confirmation Theory (ECT) proposed by Oliver (1980), which posits that satisfaction is determined by the "disconfirmation" between pre-purchase expectations and actual performance. Highly concerned consumers tend to possess elevated expectations. According to Oliver (1980), when expectations are high, the threshold for positive disconfirmation rises, making it intrinsically harder for the product to satisfy these consumers compared to those with lower expectations.
- *Implication*: Satisfaction is ultimately driven by Actual Performance (the intrinsic quality of the rice grain - i.e., the Specialty factor), not by the consumer's pre-existing concerns.

Table 13. Regression Analysis: Drivers of Consumer Satisfaction

| Independent Variable  | Coefficient ( $\beta$ ) | Beta | P-value  | Statistical Significance | Conclusion                                   |
|-----------------------|-------------------------|------|----------|--------------------------|----------------------------------------------|
| Usage: Specialty Rice | +0.92                   |      | 0.000*** | Significant              | Strong Positive Impact<br>(The Game Changer) |
| Usage: Aromatic Rice  | +0.07                   |      | 0.713    | Not Sig.                 | No Impact<br>(The "Must-be" Trap)            |
| Concern: Quality      | +0.32                   |      | 0.114    | Not Sig.                 | -                                            |
| Concern: Packaging    | -0.23                   |      | 0.147    | Not Sig.                 | -                                            |
| Concern: Price        | -0.11                   |      | 0.485    | Not Sig.                 | -                                            |
| Concern: Flavor       | -0.05                   |      | 0.694    | Not Sig.                 | -                                            |

Note: (\*\*\*) Difference is statistically significant at the 0.01 level

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

### 3.3. The need for improvements in households

Despite high overall satisfaction, **Table 14** exposes critical bottlenecks in the consumption experience. The market is not suffering from "bad quality," but rather from "unreliable quality."

- The "Consistency Crisis": The two most frequent complaints share a common root: "Poor/Unstable Quality" (17.6%) and "Variable Cooking Characteristics" (17.6%).
- Interpretation: Combined, over 35% of complaints relate to inconsistency. Consumers face a "Russian Roulette" scenario where the same brand/packaging yields different cooking results (sometimes dry, sometimes soggy) across batches. This erodes trust faster than high prices.
- Root Cause: This points to systemic issues in seed purity management and post-harvest blending practices (e.g., mixing old and new crops).
- The "Texture Misfit": Ranking third is "Inappropriate Texture (Too dry/hard)" at 15.4%. This reconfirms the "Texture Gap" identified earlier - a segment of consumers is "enduring" rice that is harder than their preference, likely due to a lack of affordable soft options.
- Non-Critical Issues: Preservation issues (weevils/mold) are minor (7.7%), and Price/Availability issues are negligible (6.6%). This indicates that modern milling technology and current pricing structures are performing well.

Table 14. Consumer Pain Points in Rice Consumption

| Pain Point / Issue Encountered                       | Frequency (n) | Percentage (%) | Severity |
|------------------------------------------------------|---------------|----------------|----------|
| Unstable Quality ( <i>Poor/Inconsistent</i> )        | 16            | 17.6%          | Critical |
| Variable Attributes ( <i>Cooking inconsistency</i> ) | 16            | 17.6%          | Critical |
| Texture Misfit ( <i>Too dry/hard</i> )               | 14            | 15.4%          | High     |
| Preservation Issues ( <i>Weevils, mold</i> )         | 7             | 7.7%           | Low      |
| Others ( <i>Price, Availability</i> )                | 6             | 6.6%           | Low      |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

While previous sections indicated high satisfaction levels (>80%), Table 15 provides the most critical indicator of the market's true "thirst" for innovation. The results signal a definitive "Green Light" for breeding programs.

- The "Open Market" Signal: An overwhelming majority of 71.4% (65 households) expressed a specific demand for rice variety improvement. This contradicts the assumption that a satisfied market is a stagnant one. An Giang consumers do not "rest on their laurels" regarding current

quality; they exhibit progressive consumption behavior, constantly seeking better performance despite current acceptance.

- Deciphering the Paradox: The discrepancy between High Satisfaction (**Table 11**) and High Demand for Improvement (**Table 15**) reveals a fascinating consumer psychology: "Satisfied but not Loyal."
- Consumers are "satisfied" because current rice is acceptable (edible, decent price).
- However, they demand "improvement" because they perceive a lack of perfection (e.g., wanting more stability, better aroma).
- *Strategic Implication:* This creates a massive "Innovation Room." New varieties can penetrate the market without the high cost of educating consumers, as the demand is already latent.
- The "Conservative" Minority: Only 28.6% of consumers see no need for change. This resistance can be explained by the Status Quo Bias theory (Samuelson & Zeckhauser, 1988), which suggests that individuals disproportionately stick with the default option to avoid the cognitive dissonance or potential regret of a wrong decision, even when the new alternative offers objectively superior utility. For this "risk-averse" segment, the perceived stability of current rice varieties outweighs the potential benefits of innovation. Consequently, in the launch phase, marketing efforts should bypass this conservative group to concentrate resources on the 71.4% active segment. This strategy aligns with the Diffusion of Innovations theory (Rogers, 2003), which categorizes consumers into five segments ranging from Innovators to Laggards. The 71.4% group seeking improvement represents the critical "Early Adopters" and "Early Majority" who drive the diffusion curve. Conversely, the 28.6% resistant group exhibits characteristics of "Laggards". According to Rogers (2003), accelerating adoption requires targeting these early segments to create critical mass, rather than expending resources on resistant laggards.

The findings from **Table 15** confirm that the breeding project is not just "scientific research" but a "Market Mandate".

The Challenge of Superiority: The challenge is *not* "How to get people to try the new rice?" (since 71.4% are eager to try). The real challenge is "How to ensure the new rice is undeniably superior?"

Because expectations are high, if the new variety performs merely *equivalent* to existing incumbents (Dai Thom 8, OM18), it will be quickly rejected. It must offer a perceptible upgrade to capture this waiting market.

Table 15. Consumer demand for rice variety improvement

| Demand Status           | Frequency (n) | Percentage (%) | Market Signal                      |
|-------------------------|---------------|----------------|------------------------------------|
| Improvement Needed      | 65            | 71.4%          | "Green Light" (High Receptiveness) |
| No Need for Improvement | 26            | 28.6%          | Status Quo Bias                    |
| Total                   | 91            | 100.0%         |                                    |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

While general demand for innovation is high, **Table 16** dissects the specific attributes that each consumer segment craves. The Chi-square test results reveal subtle nuances in taste, confirming that a "One-size-fits-all" breeding strategy is obsolete.

- The "Whiteness" Craving in Mass Market (Visual Demand):

The most distinct difference lies in the demand for Color Improvement ( $p = 0.041$ ).

- Mass Market: Consumers of Common and Aromatic rice show an extremely high demand for whiteness (>80%). For them, translucent white grain remains the primary visual proxy for "cleanliness" and "quality."
- Premium Segment: Specialty rice consumers are significantly less concerned (45.5%). With better product knowledge, they accept or even prefer a natural ivory hue, associating it with minimal bleaching and nutritional retention (bran layer).

- The "Texture Paradox" (Rising Expectations):

A counter-intuitive trend emerges regarding Softness ( $p = 0.093$ ).

- Contrary to the assumption that dry rice eaters would want softer rice, the data shows that High-yield Aromatic Rice consumers are the most demanding for softness (76.7%).
- *Interpretation:* This reflects "Rising Expectations." Consumers accustomed to aromatic rice (e.g., Dai Thom 8) have developed a sophisticated palate. They are highly sensitive to texture imperfections (e.g., rice hardening when cooled). Meanwhile, Common Rice eaters (47.4%) are less demanding, likely due to habit or a preference for soup-friendly dry textures.

- Aroma as a Universal Desire:

Regardless of the segment, the desire for "More Aroma" is consistently high (60-70% in mass segments), with no statistical difference ( $p > 0.05$ ). Aroma is the universal core value. The lower demand in the Specialty group (36.4%) simply indicates that their current rice (ST25) is already sufficiently aromatic.

Based on these findings, the breeding objectives must be bifurcated to target specific "Pain Points":

Strategy 1: Attacking the Mass Market (The Visual Strategy)

- Target: Replacing Common/Low-quality Aromatic rice.
- Priority 1 (Visual): The new variety must have a "Crystal Clear White" appearance. This is the critical hook to capture the 84.2% of consumers who judge quality by eye.
- Priority 2 (Aroma): Moderate aroma is sufficient.

Strategy 2: Retaining the Mid-End Market (The Texture Strategy)

- Target: Upgrading current Aromatic Rice users (e.g., Dai Thom 8 users).
- Priority 1 (Texture): Solve the "Retrogradation" problem (rice becoming hard when cold). The new variety must be significantly softer to satisfy the 76.7% of users demanding a texture upgrade.
- Note: Whiteness is secondary; focus on the eating experience.

Table 16. Demand for specific attribute improvements by consumer group

| Attribute to Improve | High-yield Aromatic (n=30) | Common Rice Group (n=19) | Dry Specialty Premium (n=11) | /Chi-square Sig. | Conclusion  |
|----------------------|----------------------------|--------------------------|------------------------------|------------------|-------------|
| Whiter Color         | 80.0%                      | 84.2%                    | 45.5%                        | 0.041**          | Significant |
| More Aromatic        | 66.7%                      | 68.4%                    | 36.4%                        | 0.160            | Not Sig.    |
| Softer Texture       | 76.7%                      | 47.4%                    | 54.5%                        | 0.093*           | Significant |
| Stickier Texture     | 43.3%                      | 21.1%                    | 27.3%                        | 0.244            | Not Sig.    |

Note: (\*) (\*\*) respectively at significance levels of 0.1; 0.05

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

To identify the specific drivers triggering a household's demand for rice variety improvement (Dependent Variable Y=1: Demand exists; Y=0: No demand), a Multivariate Logistic Regression model was employed. The results paint a picture of a market driven by "Negative Experiences" rather than personal profiles.

- "Pain Points" as the Sole Trigger:

The variable "Encountering Consumption Difficulties" (Has Difficulty) is the only factor with statistical significance ( $p = 0.036 < 0.05$ ) and the strongest positive coefficient (Beta = +1.36). This finding provides empirical support for expectation-confirmation theory, suggesting that consumers seek product innovation primarily when their current consumption experience fails to satisfy expectations. Rather than demographic characteristics, dissatisfaction with existing products becomes the principal driver of innovation acceptance. The Power of Dissatisfaction: The Odds Ratio (OR = 3.89) reveals a massive impact magnitude. Ceteris paribus, a consumer

currently facing issues (e.g., dry texture, unstable quality) is nearly 4 times more likely to demand a new variety compared to someone without issues. This confirms that dissatisfaction with the status quo is the primary fuel for innovation.

- The Irrelevance of Demographic Boundaries:

A strategic finding is the statistical insignificance ( $p > 0.05$ ) of all demographic and behavioral variables:

- Geography (Urban/Rural): No difference.
- Age & Rice Type: No difference.
- Conclusion: The demand for rice improvement in An Giang is a "Systemic Demand". It permeates the entire market and is not localized to any specific niche or demographic segment.

- The Latent Demand of "Rice Mixers":

Although not meeting the standard significance threshold ( $p = 0.181$  due to small sample size), the "Rice Mixing Habit" variable shows a strong positive trend with an OR = 2.24. Consumers who mix rice are 2.24 times more likely to seek improvement. This group represents a "Hidden Demand" - they are actively seeking a "hybrid texture" solution and are prime candidates for conversion if a new variety offers the "Medium Softness - Slight Fluffiness" balance they currently engineer manually.

The regression results dictate a complete pivot in the Go-to-Market strategy:

- Abandon Demographic Segmentation: Do not design "Rice for the Elderly" or "Rice for Urbanites," as their demands are homogeneous.
- Adopt "Solution-Oriented Marketing": Campaigns must focus on resolving the specific "Pain Points" identified (Stability & Texture).
- Old Message: "Delicious, premium rice from An Giang." (Generic)
- New Message (Solution): "Tired of rice that cooks dry one day and soggy the next? Our new variety guarantees 100% stability."
- Efficiency: This message targets the "Pain Point" directly, which the model proves is 4 times more effective at triggering demand than generic appeals.



Table 17. Logistic Regression Results: Factors Influencing Demand for Improvement

| Predictor<br>(Independent)                             | Variable | Coefficient Beta ( $\beta$ ) | Odds Ratio (OR) | P-value | Significance |
|--------------------------------------------------------|----------|------------------------------|-----------------|---------|--------------|
| Encountering Difficulties<br>( <i>Has_Difficulty</i> ) |          | +1.36                        | 3.89            | 0.036** | Significant  |
| Rice Mixing Habit                                      |          | +0.81                        | 2.24            | 0.181   | Not Sig      |
| Purchase Quantity                                      |          | +0.02                        | 1.02            | 0.330   | Not Sig.     |
| Current Satisfaction Level                             |          | -0.04                        | 0.96            | 0.937   | Not Sig.     |
| Use Specialty Rice                                     |          | -0.53                        | 0.59            | 0.523   | Not Sig.     |
| Use Aromatic Rice                                      |          | +0.19                        | 1.21            | 0.743   | Not Sig.     |
| Location: Urban                                        |          | -0.24                        | 0.79            | 0.677   | Not Sig.     |
| Age                                                    |          | +0.01                        | 1.01            | 0.651   | Not Sig.     |

Note: (\*\*) Difference is statistically significant at the 0.05 level

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

Data from **Table 18** prioritizes the specific traits consumers want to improve, effectively providing a technical roadmap for breeders. The results confirm previous trends while revealing critical shifts in consumer mindset.

- "Visual First": The Gatekeeper of Trial Surprisingly, "Whiter / Better Color" ranks #1 (65.9%), surpassing even taste attributes.
- *Market Reality*: Market Reality: Since consumers predominantly buy loose rice at open depots, visual inspection is the first step in quality assessment. This aligns with the global findings of Calingacion et al. (2014), who surveyed rice preferences across 24 countries and concluded that grain appearance is the critical determinant of market price and consumer acceptance. In the context of An Giang, a crystal-clear, translucent white grain is perceived as a proxy for "High Quality" (ranked #3 at 61.5%).
- *Implication*: Before a new variety can prove its taste, it must first win the "Visual Test." Breeding for a sleek, chalk-free appearance is mandatory for market entry.
- The Sensory Standard: Soft & Aromatic The core eating qualities remain "Softness" (#2, 62.6%) and "Enhanced Aroma" (#4, 60.4%).
- *Insight*: The demand for aroma (60.4%) exceeds current satisfaction levels (57.1% in Table 6), confirming that consumers are "starved" for a variety with a stronger, more lasting fragrance. Softness and Aroma are the non-negotiable twin pillars of success.
- The "Health Gap": A Massive Opportunity The most disruptive finding is the demand for "Low Glycemic Index (Low-GI) Rice" at 20.9%.



- *The Gap*: Contrast this 20.9% *desire* with the mere 3.3% *actual usage* (Table 7). This 7-fold gap represents a massive latent market. Consumers want healthy rice but reject current options due to poor palatability (dry/hard).
- *Golden Opportunity*: If the new variety can integrate Low-GI traits into a Soft & Aromatic profile, it will instantly monopolize this 20.9% segment—consumers waiting for a "Tasty Healthy Rice" solution.

Table 18. Consumer Priorities for Rice Attribute Improvement

| Rank | Attribute to Improve        | Frequency (n) | Percentage (%) | Classification           |
|------|-----------------------------|---------------|----------------|--------------------------|
| 1    | Whiter / Better Appearance  | 60            | 65.9%          | Visual Hook (Mandatory)  |
| 2    | Softer Texture              | 57            | 62.6%          | Core Value               |
| 3    | High Quality (General)      | 56            | 61.5%          | Hygiene Factor           |
| 4    | Enhanced Aroma              | 55            | 60.4%          | Core Value               |
| 5    | Easier to Cook              | 53            | 58.2%          | Convenience              |
| 6    | Stickier Texture (Đẻo)      | 28            | 30.8%          | Texture Trend            |
| 7    | Fluffier / Dryer Texture    | 19            | 20.9%          | Niche Segment            |
| 8    | Low Glycemic Index (Low GI) | 19            | 20.9%          | Innovation / Added Value |
| 9    | Colored Rice (Red/Brown)    | 6             | 6.6%           | Niche                    |
| 10   | Harder Texture              | 4             | 4.4%           | Declining                |

Source: Analysis of survey data from 91 consumers in An Giang, 2025.

The Blueprint for the "Blockbuster" Variety. Synthesizing all data points, the ideal profile for the new rice variety is defined as follows:

- **Phenotype (The "Passport")**: Must be long-grain, translucent, and highly polished (Zero Chalkiness) to satisfy the 65.9% visual demand.
- **Sensory Profile (The Core)**: Must be significantly Softer and More Aromatic than current incumbents (Dai Thom 8).
- **Unique Selling Proposition (The Weapon)**: Integrate Low-GI traits. This is the "Killer Feature" that differentiates it from ST25, converting the 20.9% of health-conscious consumers who are currently underserved.

## 4. Conclusions and policy implications

### 4.1. Conclusion

This study provides empirical evidence confirming that the rice market in An Giang province has fundamentally shifted from a "quantity-oriented" to a "quality-oriented" paradigm. The analysis of 91 households reveals a complex market landscape defined by high expectations and specific "pain points" that current varieties have yet to fully address. The key conclusions are summarized as follows:

- **The "Satisfaction Paradox" and Market Openness:** The study identifies a distinct "Satisfaction Paradox." While the vast majority of consumers (93.4%) express satisfaction with incumbent varieties like Dai Thom 8 and ST25, a substantial 71.4% of households still explicitly demand varietal improvement. This confirms that the market is not stagnant but is in a state of "Positive Saturation," where consumers are receptive to innovation if it offers tangible upgrades over existing options.
- **Drivers of Satisfaction and Change:** Regression analyses highlight that the market has moved beyond the "Aromatic" standard. The usage of High-yield Aromatic rice is no longer a differentiator but a baseline expectation ("Must-be" attribute). Maximum consumer satisfaction is now solely driven by **Specialty Rice** characteristics (Beta = +0.92). Furthermore, the primary catalyst for seeking new varieties is not demographic factors, but rather negative experiences with **product inconsistency** (Odds Ratio = 3.89).
- **The "Health Gap" Opportunity:** There is a significant disconnect between latent demand and actual consumption regarding health-oriented rice. While 20.9% of consumers desire Low-GI rice, only 3.3% currently use it. This gap is attributed to the poor palatability (hard texture) of existing functional rice. This represents a "Blue Ocean" opportunity for a new variety that successfully combines Low-GI traits with a soft, aromatic texture.
- **The "Visual First" Blueprint:** Contrary to the assumption that taste is the only priority, visual appearance acts as the "gatekeeper" for market entry. "Whiter/Better Color" is the number one requested improvement (65.9%). Therefore, any new rice variety must possess a crystal-clear, translucent appearance to pass the consumer's visual inspection at traditional retail points before its sensory qualities (Softness and Aroma) can secure repeat purchases.

In summary, the study confirms a clear "Market Mandate" for breeders: the next generation of rice for An Giang must be a "Specialty-Standard" variety that is visually pristine, genetically stable, and integrates health benefits without compromising the soft, aromatic texture that consumers demand.

#### *4.2. Policy implications*

The transition of the An Giang rice sector from a production-centric model to a market-centric model requires synchronized adjustments in breeding, production, and commerce. Based on the empirical evidence gathered, the following implications are proposed:

- **Reorienting Breeding Objectives toward "Consumer-Defined Quality"** Current breeding programs must pivot from purely agronomic goals (yield, pest resistance) to sensory-driven goals.

- The "Visual-Sensory" Mandate: State-funded research should prioritize selecting lines with crystal-clear, translucent grain appearance and soft, aromatic textures. Visual appeal should be treated as a mandatory "pass/fail" criterion before assessing yield potential.
- The "Health-Taste" Convergence: Policies should encourage the development of functional rice (Low-GI) that does not compromise on texture. R&D grants should target the creation of "Soft Low-GI" varieties to capture the 20.9% latent market demand, addressing the specific needs of the aging rural population and health-conscious youth.
- Institutionalizing "Quality Consistency" in the Value Chain To address the "Consistency Crisis" where over 35% of consumers complain about unstable quality, strict management of seed purity and post-harvest processing is essential.
- Zoning for Specialty Rice: Local authorities should establish dedicated raw material zones for specialty varieties (like ST25) to prevent genetic dilution and cross-contamination.
- Standardization: Implement stricter standards for milling and blending at local rice depots to ensure that the rice reaching consumers maintains consistent cooking characteristics across batches.
- Segmented Commercialization Strategies The "One-size-fits-all" distribution policy is obsolete. A dual-track strategy is recommended:
  - Urban Strategy: Agribusinesses should focus on building trust through "Traceability Marketing" targeting Gen Y parents. Modern retail channels must feature transparent origin tracking (QR codes) to overcome the "Trust Deficit" regarding safe rice.
  - Rural Strategy: Distribution should leverage the existing network of traditional depots but introduce "Specialty Lines" that farmers cannot self-cultivate. This creates a commercial niche in a market otherwise dominated by self-supply.
- Revitalizing the "Aromatic" Standard Since standard aromatic rice has become a commodity with diminishing returns, agricultural extension services should advise farmers to gradually upgrade from common aromatic varieties (e.g., OM18, Dai Thom 8) to higher-value specialty tiers. This preemptive shift is necessary to avoid the "income trap" of producing varieties that consumers now view as basic standards rather than premium products.

#### *4.3. Limitations and future research*

This study provides valuable insights into consumer preferences for rice varieties and market-driven breeding strategies in An Giang Province. Nevertheless, several limitations should be acknowledged.

First, although the sample size of 91 households satisfied the minimum statistical requirement for the applied regression analyses, it remains relatively modest for generalizing consumer preferences across the entire Mekong Delta or Vietnam. Future studies should employ larger and

more geographically diverse samples to improve external validity and allow comparisons among different ecological and socio-economic regions.

Second, the study adopted a stratified convenience sampling approach because of practical constraints in accessing households. Although this method enabled the inclusion of respondents from both rural and urban areas, it may introduce sampling bias and limit the representativeness of the findings. Future research may consider probability-based sampling techniques to enhance the robustness of the conclusions.

Third, the analysis relied primarily on self-reported consumer perceptions and stated preferences rather than objective measurements of rice quality. Consumer evaluations of aroma, softness, cooking quality, and satisfaction may therefore be influenced by individual experience and perception. Future studies should integrate sensory evaluation panels together with physicochemical analyses of rice quality, including amylose content, gel consistency, grain appearance, and cooking characteristics, to validate consumer assessments.

Fourth, this study employed a cross-sectional research design, capturing consumer preferences at a single point in time. As rice consumption behaviour and market expectations may evolve due to changes in income, health awareness, and food trends, longitudinal studies would provide a better understanding of how consumer preferences change over time.

Finally, the present study mainly examined current consumption behaviour and the demand for rice variety improvement. Future research could extend this work by investigating consumers' willingness to pay for newly developed rice varieties, applying discrete choice experiments to estimate preferences for multiple rice attributes, and comparing consumer preferences across different provinces or market segments. Such studies would provide stronger empirical evidence to support market-oriented rice breeding and commercialization strategies.

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