

Perception and Attitude of Consumer Patronage of Ghana-Grown Rice: Evidence from Kumasi, Ghana

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Abstract

Increasing human population, urbanization, and changing consumption trends have contributed to the emergence of rice as the leading staple food in Ghana. Despite its importance in the Ghanaian diet, patronage and consumption of locally grown rice is not yet widespread. This study investigates consumer patronage of locally grown rice in the Kumasi Metropolis, Ghana, and fills a critical gap in understanding the specific factors that influence consumer preferences in urban settings. Data were collected through a cross-sectional survey of 120 respondents across different income categories using a multistage sampling technique, and analyzed using descriptive statistics, a Probit model, and Kendall's coefficient of concordance. The study found that cooking quality, palatability, colour, and fragrance were the primary attributes that influenced consumer preferences. Probit analysis revealed that income and the frequency of rice consumption significantly influenced the likelihood of purchasing locally grown rice. Specifically, a higher income decreases, while frequent rice consumption increases the likelihood of choosing local rice. Key constraints identified include perceived high cost, limited availability, and concerns about the quality of rice. This study recommends that local rice producers, agricultural organizations, and government bodies should make efforts to improve the sensory and culinary qualities of locally grown rice through improved processing techniques, increased promotion, and campaigns to ensure the commodity is readily available to consumers. These strategies aim to boost local rice consumption and support agricultural sustainability and food security in Ghana.

Keywords: locally grown rice, patronage, consumption, urban consumer choice, probit model

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1. Introduction

Globally, rice production and consumption are significant, as it is a staple food for a large proportion of the population (Ohtsubo & Nakamura, 2022; Coffie et al., 2024). In Asia, where more than 90% of the world's rice is produced and consumed, it is an important source of calories and nutrients (Food and Agriculture Organization (FAO), 2021). Most Sub-Saharan African (SSA) countries including Nigeria, Côte d'Ivoire, and Ghana, have witnessed significant increases in rice consumption especially in the last three decades (FAO, 2021), as dietary patterns and preferences have changed due to urbanization, population growth, and self-growth (De Vos et al., 2023). A study by Ashitey & Archibald (2018) in Ghana showed that rice consumption is fueled by rapid urbanization, a growing middle-class society, a growing tourism industry (GAIN, 2018), and an increase in women working outside home. A great volume of this demand is however met through imported rice.

Domestic production has not kept pace with this demand, leading to significant imports to meet consumption gap (Opoku & Akorli, 2009; Diako et al., 2010; Ayeduvor, 2018; Statista, 2021; AGRA, 2021; Arouna et al., 2021). Although most West African countries have implemented diverse strategies to improve domestic rice production, the region still depends heavily on Asian imports to meet its needs (Demont et al., 2017; Africa Rice Center, 2020). Major factors that have contributed to over-reliance on imported rice include domestic supply side constraints such as inferior rice varieties in terms of yield and consumer preference, poor agronomic practices, lack of production infrastructure, and consumer demand for quality rice with superior attributes including taste and aroma (MoFA-IFPRI, 2019). Production constraints including lack of access to credit to smallholder farmers, cultivation of inferior varieties, poor processing facilities (Diako et al., 2010), and an under-developed rice value chain have contributed to Ghana's non-competitive rice industry. The presumed superior quality of imported rice drives consumers to patronize them than locally grown rice (Ananng et al., 2011; Alhassan et al., 2015; Amfo et al., 2024).

In Ghana, especially in urban centers, rice plays a crucial role in individuals' dietary habits. Rice is the second most important staple food next to maize in terms of production and consumption (MoFA, 2022). Although rice exhibits high income elasticity, per capita consumption has risen by over 35% in the last 10 years because of changes in consumption patterns driven mainly by urbanization, shifting dietary patterns, and improved living standards (Angelucci et al., 2013; Melo et al., 2015). Per capita consumption of rice in Ghana has risen from 24kg in 2012 to 35kg in 2017 (Andam et al., 2019; MoFA, 2022) and 49kg in 2021 (GAIN-USDA, 2022). Since Ghana is only able to meet approximately 27% of the total requirements, about 70% of all rice consumed comes from imports (MoFA, 2018), mainly from Thailand, Vietnam, USA, and China. The over-reliance on rice imports exacerbates Ghana's precarious foreign exchange imbalances and reinforces concerns of vulnerability to international rice price shocks (IFPRI, 2020). This has huge implications for the local rice value chain, according to experts and advocates of domestic rice consumption, hence the need to stimulate patronage of Ghana-grown rice.

Despite the importance of rice in the Ghanaian diet, there is a disparity in the patronage of locally grown rice compared with imported varieties, reflecting a common trend observed in many countries (WARDA, 2008; Ocloo et al., 2017; Ragasa & Chapoto, 2017; MoFA, 2020; IFPRI, 2020). Ghanaian consumers have developed a taste and preference for imported long-grain aromatic rice (IFPRI, 2020) and this is driven mainly by key factors such as perceived quality attributes, taste, price, and packaging of the commodity (Diako et al., 2010). This preference for imported rice has resulted in higher consumption of imported rice over locally produced varieties, raising concerns about its impact on the local rice industry in Ghana. The Ghanaian rice market, like other markets, is segmented based on quality characteristics, processing levels, and source of production or country of origin. The market relies heavily on imported rice, mainly from Thailand, Vietnam, USA, and China, which accounts for a significant portion of rice consumption in Ghana (MoFA, 2020). This shift in consumer behavior has posed challenges to maintaining the sustainability of the local rice industry. Despite calls for increased consumer patronage of local products, particularly locally grown rice, which plays a key role in economic development, agricultural sustainability, and food security in Ghana, challenges remain (Bannor et al., 2023). Coffie et al. (2024) argue that buying local rice supports smallholder farmers and reduces their dependence on imports, thereby boosting the national economy. Furthermore, investment in consumer education can influence consumers to patronize locally grown rice if they are well informed about its attributes such as nutrient content and economic benefits (Asante et al., 2023).

There has been a surge and a growing body of literature in the rice subsector, given the significance of the commodity in the economies of SSA countries including Ghana. However, most studies have focused on production (Ragasa & Chapoto, 2017), productivity and efficiency, marketing (Zalkuw, 2019; Amfo et al., 2024; Asante et al., 2023), and consumption (Ayeduvor, 2018; Coffie et al. 2024). Consumer behaviour and preference for rice have also received attention in recent years (Ehiakpor et al., 2017), but there is scant literature on consumption patterns and preferences for domestically grown rice. Empirical studies in consumer preference for domestically grown rice have predominantly focused on general consumer attitudes, quality perceptions, market competitiveness, and preference for imported rice (Ehiakpor et al., 2017; Asante et al., 2023) which provide limited information on the specific factors driving the patronage of locally grown rice.

Despite the growing interest in promoting local rice consumption, there is a significant research gap regarding the unique factors that determine consumer preferences for domestically grown rice and behaviours, especially in the urban context. Addressing this gap is essential to enhance the competitiveness of locally produced rice and its consumption, support domestic agriculture, and ensure food security in Ghana. Based on this apparent gap in the literature, this paper aims to provide empirical evidence on urban consumers' preferences and behaviors towards locally produced rice. Specifically, this study attempts to investigate the factors that motivate consumers to patronize locally produced rice, and the constraints they face in consumption or patronage of locally produced rice. The contribution, therefore, of this study to the extant rice literature is the quest to provide empirical evidence on consumer preference and choice for Ghanaian grown rice. This will also provide the basis for an evidence-based development of policies and strategies to promote sustainable consumption and patronage of locally produced rice, thus stimulating agricultural development and food self-sufficiency in Ghana. In the process substantial benefits accrue to the economy by foreign exchange savings and a major boost to Ghana's agro-industrialization agenda. The rest of the paper is organized as follows. Section 2 provides the empirical literature on consumer choice and preference for

rice. Section 3 details the methodology employed in this study, while section 4 presents the results and discussion of the findings. Finally, the conclusions and policy recommendations are presented in section 5 of the paper

2. Literature Review

According to consumer behavior theory, consumers' perception of quality is based on three main attributes: (1) search characteristics (usually observable before consumption, such as colour of rice, cleanliness, and brokenness of grain); (2) experience characteristics (which is determined at the point of consumption, such as taste and flavour); and (3) credence characteristics (not readily verifiable by the consumer, such as long term health hazards) (Becker, 2000; Hoffman, 2002; Northen, 2002). Consumer preference and demand for food products vary significantly across different regions and are influenced broadly by commodity attributes (extrinsic and intrinsic factors), culture, socio-economic factors. Extrinsic factors are the visually observable attributes of the commodity such as cleanness, colour, whiteness, breakages, form of grain, packaging, brand, and price (USAID, 2009; Rutsaert et al., 2011). The intrinsic attributes are usually the non-visual and unobservable traits such as ease of cooking, grain stickiness, taste, aroma, texture of grain, swelling capacity, and conservation after cooking. Others are factors such as sensory evaluations, quality, attitudes towards local products, price competitiveness, cultural affinity, socioeconomic and environmental factors (Ehiakpor et al., 2017; Rahnama, 2017; Wahyudi et al., 2019; Custodio et al., 2019; Ab Samat et al., 2022; Oladejo, 2023). Custodio et al. (2019) reported that consumers in Asia prioritize the fragrance and texture of rice, whereas in Africa, price and availability are more critical determinants. According to Twine et al. (2023), the preference for imported rice in many African countries is often attributed to its perceived superior quality and consistency compared to locally produced varieties. Fiamohe et al. (2015) found that quality attributes such as cleanliness, whiteness, taste, and swelling capacity are significant factors influencing consumer preferences for locally grown rice. They discovered that consumers were willing to pay a premium for cleanliness and whiteness, with premiums reaching up to 46% and 53% of the actual price for local rice, respectively. Similarly, the quality of parboiled rice, including attributes such as brown color and the presence of unshelled paddy, significantly affects consumer acceptability (Tomlins et al., 2005). Furthermore, Obayelu et al. (2022) reported that cleanliness and the absence of foreign materials are major attributes consumers consider when purchasing local rice brands. Sensory attributes such as taste, aroma, and texture are also critical in determining consumer preferences for local rice. According to Nauli and Sihombing (2020), consumers prefer local rice, which is tasty, clean, durable, and has a fragrant flavor. They also found a strong relationship between estimated preferences and actual preferences in patronizing local rice. A study by Agbas and Ceballos (2019) also found texture and variety as the most important local rice attributes, with consumers preferring tasty, aromatic, sticky, and plain white rice. The whiteness and absence of foreign materials were reported by Ogundele (2014) as the most highly rated criteria for selecting local rice in Nigeria. A study by Ehiakpor et al. (2017) claimed that consumers in Ghana consider good-looking grains, excellent packaging, and the absence of foreign materials as their top traits in patronizing local rice. Additionally, in Malaysia, perceived quality factors such as aroma, taste, cooking duration, and ease of cooking were significant determinants of local rice selection (Ab Samat et al., 2022).

Similarly, several studies have highlighted the importance of socioeconomic characteristics in shaping consumers' preferences for locally grown rice. For example, studies conducted in Indonesia found that gender, age, occupation, education, and income significantly influence the frequency of purchasing locally produced rice (Wahyudi et al., 2019). Likewise, a study in Nigeria identified age, marital status, education, frequency of purchase, price, and primary activity of the household head as significant determinants of consumer preference for local rice (Ogundele, 2014). In Ghana, income, age, sex, and marital status were significant factors influencing household preferences for locally produced rice (Ehiakpor et al., 2017). Other studies have revealed income levels, household size, and urbanization as determinants of consumer behaviour when purchasing local rice (Twine et al., 2023; Amfo et al., 2024; Coffie et al., 2024). According to Coffie et al. (2024), income levels significantly impact purchasing behavior, with higher incomes often correlating with greater willingness to pay a premium for locally produced rice. Conversely, lower-income consumers may opt for locally grown rice if it is perceived as more affordable or offers better value-for-money (Twine et al., 2023). Trang et al. (2023) also found education as an important factor in determinants of consumer behaviour in purchasing local rice. They found that educated consumers are more aware of the benefits of locally grown food, such as its nutritional value and support for the local economy, which leads to a higher likelihood of choosing locally grown rice over imported varieties. Additionally, authors like Boansi and Favour (2015) found household size as a major factor that influence consumer preferences for locally grown rice. They reported that larger households may prioritize affordability and quantity, whereas smaller households focus more on quality and variety, especially when considering the nutritional needs of children and elderly members. As discussed by Custodio et al. (2019), urbanization influences consumer preferences by providing better access to diverse food products. However, there is a growing trend of urban consumers seeking local and organic options due to health and environmental concerns.

Moreover, social networks and community influence, as noted by Moser et al. (2011), significantly impact consumer choices of local rice, with recommendations from family, friends, and community leaders playing a pivotal role in

promoting locally grown rice and creating a positive feedback loop that boosts demand. Consumers are also motivated to patronize locally grown rice due to economic factors such as high production and import bills, and quality factors such as taste, whiteness, absence of foreign matter, aroma, and grain shape (Fiamohe & Kinkpé, 2016). Ab Samat et al. (2022) identified price competitiveness, health consciousness, perceived quality (e.g., aroma, taste, cooking duration, and ease), and informative packaging as factors influencing consumers' decision to purchase local rice. Their findings revealed that the price factor influenced the purchase decision of local rice consumers more significantly than other factors (health consciousness and quality perception), whereas packaging had the least influence on the purchase decision. On the other hand, the importance of health consciousness and buying local rice for safety reasons was found by rice consumers in Iran and Ghana to be crucial motivators for buying local rice (Ab Samat et al., 2022; Coffie et al., 2024). Sani et al. (2023) and Oladejo (2023) also identified affordability as a major significant variable affecting consumer preference and patronage for local rice. Additionally, environmental awareness and the smaller environmental footprint of locally grown rice compared to imported rice varieties make locally grown rice more attractive for consumers to patronage (Thilmany et al., 2008; Dentoni et al., 2009). Other studies have asserted that cultural and ethnocentric considerations also influence preferences and patronage of local rice, with consumers proud of their national heritage showing a preference and demand for local products (Nguyen et al., 2008; Guo & Zhou, 2017). According to Wahyudi et al. (2019), effective marketing strategies, government support, and public awareness campaigns boost local rice patronage. Similarly, Anabila (2015) and Ibrahim et al. (2022) addressed the influence of marketing aspects such as branding, advertising, and promotions on local rice patronage. They reported that consumers responded favorably to the brand name and packaging of local rice. However, consumers in Ghana favor foreign rice brands over domestic ones (Anabila, 2015). In addition, as noted by Keller (2013), the marketing of local rice by emphasizing quality, freshness, and price competitiveness are also factors that influence consumer patronage of local rice, which is recommended to attract environmentally conscious consumers and those inclined to support family farms.

Empirical studies have also identified various constraints on consumers' consumption or patronage of locally grown rice. One significant constraint is the perceived lower quality of locally grown rice compared to imported varieties (Wahyudi et al., 2019; Amfo et al., 2023). Consumers often associate imported rice with better post-harvest processing and packaging standards, which sometimes overshadows the promotion of local rice (Amfo et al., 2023). This perception has been identified as a major deterrent for consumers who prioritize quality and consistency in their food choices. Another constraint is the limited availability and accessibility of locally grown rice. Seck et al. (2012) found that poor distribution networks and lack of market access for local farmers limit the availability of locally grown rice. According to them, consumers are more likely to purchase imported rice if it is readily available and easy to access. Furthermore, consumers' reluctance to consume locally grown rice is influenced by various constraints such as cooking difficulty, limited suitability for local dishes, lack of taste and aroma, foreign materials, poor packaging, standard specification issues, unavailability (Coffie et al., 2024), cleanliness and absence of stones in local rice (Obayelu et al., 2022), trust in technology processing and marketing factors (Iweka & Nwazugbo, 2022), regulatory agencies' role in ensuring quality control and consumer trust in standards (Oteh et al., 2018), and the importance of branding strategies to boost local rice consumption (Anabila, 2015). According to Diagne et al. (2012) and Nwachukwu et al. (2020), factors such as the quality of milling technology, branding, packaging, and the presence of foreign materials in rice are major constraints on the consumption or patronage of locally grown rice by consumers. Similarly, Oladejo (2023) found that high presence of debris and price leads to low consumption and patronage of local rice, as confirmed by Wahyudi et al. (2019) in their studies.

3. Materials and Methods

3.1. Study area and data

This study was conducted in the Kumasi Metropolis in the Ashanti Region of Ghana, which covers an approximate area of 214.3 square kilometers and lies between latitudes 6.35°N and 6.40°S, and longitudes 1.30°W and 1.35°E (GSS, 2021). It has an estimated population of 443,981 (GSS, 2021) and bordered by Kwabre East district to the north, Atwima district to the west, Ejisu-Juabon Municipal to the east, and Bosomtwe to the south. Figure 1 presents a map of the study area, which shows that it is strategically located in the middle belt of Ghana and has 10 sub-metros: Asokwa, Kwadaso, Bantama, Nhyiaeso, Manhyia, Asawase, Oforkrom, Tafo, Subin, and Suame.

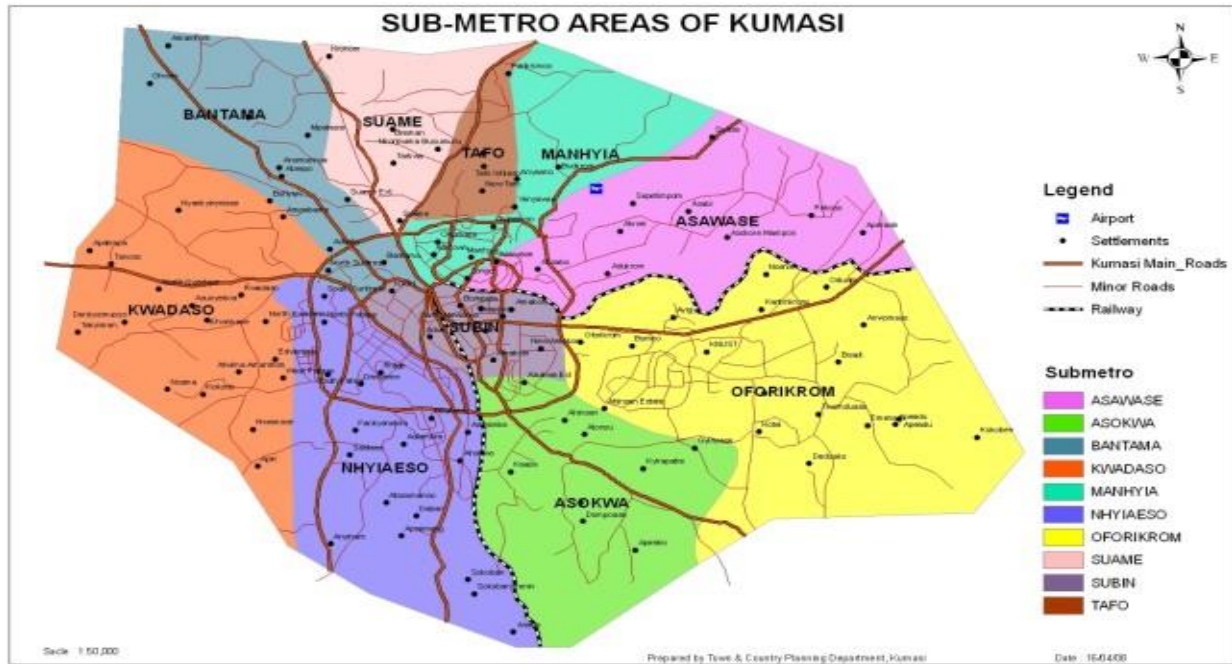


Figure 1. Map showing sub-metros in Kumasi
 Source: Kwakwa (2013); Nimoh et al. (2018)

Kumasi Metropolis was chosen due to its diverse population, dynamic markets, significant economic activities, rapid urbanization, and changing dietary habits in relation to local rice consumption and patronage (Ibrahim et al., 2022). Furthermore, it is a major urban center and the second-largest city in Ghana. Thus, data collection from consumers living in and around the city can provide insights into their key preferences, factors, and constraints on the consumption or patronage of locally grown rice within the context of this bustling metropolitan area.

This study used primary data collected through a cross-sectional survey. A multistage sampling technique was used to identify an appropriate sample. In the first stage, a stratified random sampling was used to classify communities based on three income categories-high, middle, and low income - to ensure the representation of diverse consumer groups in Kumasi Metropolis. Table 1 presents the classification of communities based on the three income classes.

Table 1: Income classes of residential communities in the Kumasi Metropolis

High Income	Asokwa, Dadiesoaba, Mbrom, West Ayigya, Adiembra, Ahodwo, Adiebeba, Odeneho Kwadaso, Asokwa Residential Area, Aketego, Danyame, Bompe, Bomso, Nhyiaeso, Ridge, Parakuo Estate, , New Amakom Extension, Daban New Site, Extension
Middle Income	Asafo, Amakom, Airport, Bantama, Dichemso, Aprade, New Tafo, Asebi, Anyinam, Kuwait, Atonsu, New Atonsu, Gyenyase, New Agogo, Adoato, Kyirapatre Estate, Bohyen, Adumanu, Adumanu Extension, Asanti Newtown, Apiri, North Suntreso, Kotei, Patase, Boadi West Patase, Ohwimase, Kentinkrono, Santase Odumase Extension, Kwadaso Estate, South Suntreso
Low Income	Abrepo, Dompouse, , Dichemso, Old Tafo, Buokrom, Ayigya Zongo, Sawaba, Yalwa, Daban, Kaase, Anwomaso, Adukrom, Asawase, Buobai, Nima, Pakuso, Sokoban, Amanfrom, Yenyawso, Dakwadwom, Ayeduase, Apatrapa, Aboabo, Moshie Zongo, Sokoban, Nsenee, Ahinsan, Gyinyase

Source: Adapted from Nimoh et al., 2018.

In the second stage, a simple random sampling technique was applied to select 4 communities each in the three income categories listed in Table 1. Table 2 presents the communities that were randomly selected from the income classes. Thus, a total of 12 communities were selected across the three income classes. In the third and final stage of the sampling approach, a systematic random sampling technique was used to select individual respondents in each community. The households within the community served as the population framework for systematic selection, since there was no official list of households accessible for each community. The first step was to choose a random household in each community to serve as a starting place, such as one closer to a landmark or street intersection. The next step was to estimate the total number of households in each community in order to set the sample interval. This estimate was divided by the minimum number of respondents required for each community, which was established at 10. For instance, the sampling interval was every tenth household in a community with an estimated 100 households. We visited every tenth household, beginning at the randomly selected starting point, until the objective of ten respondents for each community was achieved.

Table 2: Sampled communities and respective sample sizes

Income Category	Residential communities	Sample size
High income	Nhyiaeso	10
	Danyame	10
	Ahodwo	10
	Odeneho Kwadaso	10
Middle income	Asanti Newtown	10
	Bantama	10
	Atonsu	10
	Kotei	10
Low income	Dichemso	10
	Asawase	10
	Abrepo	10
	Ahinsan	10

Source: Field survey, 2023.

The next immediate household was selected as a replacement in cases where a selected household did not satisfy the inclusion criteria, such as not having any rice consumers. It was determined that in each selected community 10 respondents were selected. This made the total sample size to be 120 respondents. Thus, 40 respondents each were selected across the three income classes (see Table 2), ensuring equal representation across different income categories. Data were collected mainly through personal interviews using structured questionnaires. An initial test was conducted to ensure the reliability and validity of the survey instrument. This study focused on rice consumers, including households, schools, offices and markets, categorized based on their income levels due to the inherent relationship between consumption patterns and income (Edgmand, 1987).

Table 3 reports the description of the data, focusing on socio-economic and rice consumption characteristics. Majority of the respondents were females (58%) and this is consistent with those of Amfo et al. (2019), Diako et al. (2010), and Isife and Emodi (2000), who report the significant role of women in household food choices and purchase decisions in Ghana.

Table 3. Socioeconomic characteristics of respondents

Discrete Variable	Category	Frequency (N = 120)	Percentage	
Gender	Male	50	41.7	
	Female	70	58.3	
Marital status	Married	47	60.8	
	Not married	73	39.2	
Religion	Christian	78	65.0	
	Muslim	42	35.0	
Educational level	Basic education	17	14.2	
	Secondary	21	17.5	
	Vocational/Technical	37	30.8	
	Tertiary	25	20.8	
Preferred rice source	Postgraduate	20	16.7	
	Wholesale shop	33	27.5	
	Local market	69	57.5	
	Supermarket	18	15.0	
Amount spent on rice consumption/day	GHC5-10	0	0.00	
	GHC11-20	0	0.0	
	GHC21-25	0	0.0	
	GHC26-30	13	10.8	
	GHC31-35	48	40.0	
Frequency of rice consumption	GHC36-50	2	1.7	
	Daily-Almost Everyday	60	50.0	
	More than once a week	58	48.3	
	Weekly (once a week)	2	1.7	
Continuous Variable	Mean	Std. Dev	Minimum	Maximum
Age (years)	33.6	12.2	15	70
Income (GHC)	1397.8	214.9	1047.2	1608.2
Frequency of rice consumption	1.5	0.5	1	3
Amount spent on consumption of rice/week in (GHC)	37.4	5.74	28	43

Source: Field survey, 2023

The mean age is 34 years with a range of 15 to 70 years. Christians (65%) were the majority while 35% were Muslims. Most of the respondents in this study were married people (61%) who are more likely to cook and therefore make choices in the type of rice to buy. Education was relatively high among the respondents as there was no one without a formal education. About 14% of respondents have attained basic education, secondary education (18%), vocational/technical education (31%), and tertiary education (21%). The relatively high level of education of respondents is expected to have an influence on the awareness and preference for locally grown rice, perhaps due to better knowledge of the benefits of local rice, such as its freshness, nutritional value, and economic impact on local farmers.

The choice of location or market is essential for marketing strategies because it has a significant influence on consumer preferences and purchasing behavior towards rice brands. Majority of the respondents (58%) preferred open or local markets wholesale as an outlet to purchase rice due to proximity, convenience, and access to product variety, while about 28% preferred wholesale shops, and 15% preferred supermarkets. This result is consistent with the findings of Diako et al. (2010), who highlighted the role of convenience locations in influencing consumers' preferences and purchasing behaviour for rice in Ghana. Further evidence showed that rice consumption was prevalent as expected, with more than 50% of respondents consuming it daily and 48% consuming it at least twice or more weekly. This affirms the assertions in the literature (e.g. Kushitor, 2023; Nyarko & Bartelmeß, 2024) of the increasingly changing consumer dietary patterns and preference for rice as the choice staple, even in areas where other cereals and tubers have historically dominated. Consumers reported a mean household income of GHC 1,397.8, with a range of GHC 1,047 to GHC 1,608. With a standard deviation of GHC 214.9, this indicates moderate income variability. This observation suggests that most respondents belong to the low-income bracket category, according to the GLSS data, given that the mean income earnings of urban dwellers is GHC 3,715 (GSS, 2018), and this probably accounts for their ranking of rice as expensive. The amount spent on rice daily varies, ranging from GHC 36 to GHC 50, which is indicative of disparities in rice budget allocations, family size, place of purchase, and possible dietary preferences for quality. On average, respondents spend GHC 37.4 daily, with a range of GHC 28 and GHC 43. This finding suggests that consumers have consistent spending patterns and a common understanding of rice pricing.

3.2. Methods of data analysis

The first aim of this study is to estimate the factors that influence the preferences of respondents in purchasing locally produced rice. The conceptualization of consumer preference is key to identifying the appropriate econometric approach. In this study it is consumer preference and is conceptualized as a binary discrete choice variable. This implies that there are two choices defining consumer preference, namely, either a respondent makes preference for locally produced rice or not. If a consumer makes a preference for locally produced rice a value of 1 is assigned and 0 otherwise. In econometric modelling, two main estimation approaches are suitable for this present conceptualization. These are the binary Probit and binary Logit models. While these two models generally produce similar results, they are different in their underlying assumptions. The Probit model assumes cumulative normal distribution and the Logit model assumes logistic distribution.

This study relies on the binary Probit model to estimate the factors that influence consumers' preferences for purchasing locally grown rice. In making this choice, this study apparently assumes cumulative normal distribution of the data, an assumption tenable principally because of the random approach in drawing the sample. Research on consumer behavior and rice consumption has revealed differences among consumers who opt for locally grown or imported rice varieties. Although we acknowledge that this model may not capture all nuances of consumer behavior, it provides a useful framework for examining important variables and generating initial insights. The binary Probit model is theoretically expressed as:

$$P(Y=1/X)=\Phi(X'\beta+\varepsilon) \quad (1)$$

Where $P(Y=1/X)$ represents the probability that a consumer prefers locally grown rice (1 = prefers locally grown rice; 0 = otherwise), Φ is the cumulative density function, β is the coefficient to be estimated, X represents the explanatory variables reported in Table 4, and ε is the random disturbance term.

Table 4. Description and measurement of variables used in the Probit model

Variable	Measurement	Expected sign	Related Literature
Dependent variable			
Preference for locally grown rice	Dummy: 1 = prefers locally grown rice; 0 = otherwise		
Explanatory variables			
Age	Number of years	+	Ogundele (2014); Wahyudi et al. (2019)

Gender	Dummy: 1 = Male; 0 = Female	+/-	Ogundele (2014); Ehiakpor et al. (2017); Ab Samat et al. (2022)
Marital status	Dummy: 1 = Married; 0 = otherwise	+	Ogundele (2014); Ehiakpor et al. (2017)
Religion	Dummy: 1 = Christian; 0 = otherwise	+	Ogundele (2014)
Educational level	Dummy: 1 = if the highest education is high school or higher; 0 = if primary school education or less	+	Ogundele (2014); Wahyudi et al. (2019); Trang et al. (2023)
Income	Ghana cedi (GHC)	+	Ogundele (2014); Wahyudi et al. (2019); Ab Samat et al. (2022); Coffie et al. (2024)
Frequency of rice consumption	Number of times rice is eaten in a week	+	Ogundele (2014)

Source: Author’s own construct

Numerous studies (e.g., [Asante et al., 2023](#); [Wongnaa et al., 2024](#)) used the Kendall's coefficient of concordance (W) to measure respondents’ level of agreement among a set of constraints. This study also employs the Kendall’s W to analyze the constraints that consumers face in the consumption or patronage of locally grown rice. Respondents were asked to rank the various constraints presented in Table 5 in the order of significance.

Table 5. Constraints in consumption or purchasing of locally grown rice

Constraints
Ghana grown rice is not well advertised (not well known to me)
Ghana rice has many broken grains
Ghana rice has poor cooking attributes
Ghana rice has poor fragrance/aroma
Ghana rice is expensive
Ghana rice is full of foreign matter
Ghana rice is not readily available
Ghana rice is not tasty or palatable
Ghana rice is not well-branded
Ghana rice stores bad after cooking

Source: Author’s own construct

This measure evaluates the degree of agreement between multiple judges without parametric assumptions ([Wongnaa et al., 2024](#)). The formula for Kendall’s W is given by:

$$W = \frac{12S}{p^2(n^3-n)-pT} \tag{2}$$

Where, P represents the number of constraints, n is the sample size, and T and S are the correlation factors for the bound ranks and sum of square statistics, respectively. The underlying hypothesis to be tested by the Kendall's W is stated as

H₀ (null): There is no consensus among consumers regarding the constraints they face in the consumption or patronage of locally grown rice.

H₁ (alternate): There is consensus among consumers regarding these constraints.

The significance of W is assessed by comparing the calculated and critical chi-square values, with the rejection of the null hypothesis in favor of the alternative hypothesis indicating respondents’ agreement on ranking of these constraints.

4. Results and Discussions

4.1. Attributes that Influence Consumer Preference for Locally Grown Rice

Figure 2 presents the results on the key attributes of locally produced rice that influence the preferences and choice of respondents. It shows that consumer preferences for locally grown rice are influenced by a variety of attributes beyond the traditional taste and price. Among the respondents, 28% prioritized cooking quality as the key attribute, highlighting the

importance of rice that cooks well, retains good texture and meets culinary expectations. This reflects the desire for a pleasant taste and overall dining experience. This is consistent with the findings of [Nauli and Sihombing \(2020\)](#), who identified quality as a critical factor in food choice.

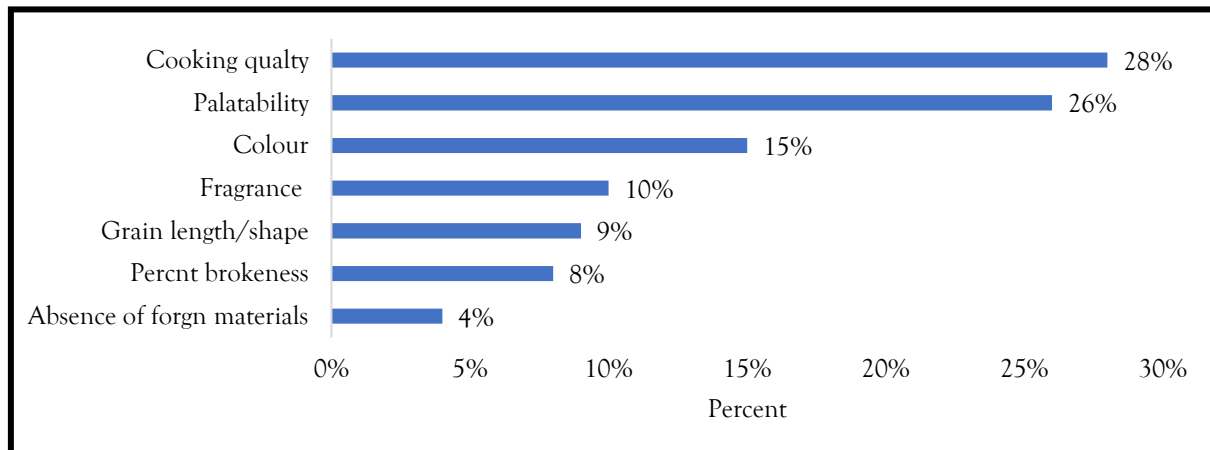


Figure 2 Key attributes influencing consumer preference for locally grown rice
Source: Field survey, 2023

Palatability (26%), rice colour (15%), and fragrance (10%) were also important attributes, with visual appeal and aroma increasing desirability and satisfaction, which is consistent with the literature on aesthetics and sensory qualities influencing consumer decisions ([Custodio et al., 2019](#)). In addition, grain length and shape (9%), broken grains (8%), and the absence of foreign material (4%) were reported as key attributes, indicating preferences for specific grain characteristics, whole grains, and cleanliness, respectively. Studies have confirmed that the visual and perceived quality impacts of broken grains, grain length and shape, and the absence of foreign material influence consumer decisions ([Ogundele, 2014](#); [Ehiakpor et al., 2017](#); [Obayelu et al., 2022](#)).

4.2. Determinants of consumers' preference for locally grown rice

Table 6 shows the probit results of the factors that motivate consumers to patronize locally grown rice in the study area. The results showed that the probit model yielded a likelihood ratio (LR) chi-square value of 8.02 (p -value = 0.3305) and a pseudo-R-squared value of 0.0486, indicating a weak fit. While these statistics suggest that the model explains a limited portion of the variability, they also highlight the inherent complexity of consumer behavior and the exploratory nature of our study. Income and frequency of rice consumption are the factors that influenced consumers' preference for purchasing locally grown rice.

Table 6. Determinants of consumers' preference for locally grown rice

Variable	Coefficient	Dy/dx	Probability
Age	0.003 (0.011)	0.001	0.770
Gender	0.138 (0.242)	0.052	0.568
Marital status	-0.163 (0.260)	0.061	0.531
Religion	-0.002 (0.254)	-0.001	0.994
Educational level	0.170 (0.380)	0.064	0.654
Income	-0.004*** (0.002)	-0.001***	0.009
Frequency of rice consumption	0.005** (0.003)	0.002**	0.030
Constant	3.700** (1.716)		0.031

Sample size = 120

LR chi2(7) = 8.02

Prob > chi2 = 0.3305

Pseudo R² = 0.0486

Log likelihood = -78.565001

Note: Standard errors in parentheses, *** $p < 0.01$, and ** $p < 0.05$

Source: Field survey, 2023

In other words, income and the frequency of rice consumption increase the probability that a consumer will prefer to purchase locally grown rice. The coefficient of income is negative and statistically significant at 1% which signifies a strong relationship between income and consumer preference for purchasing local rice. The negative estimate suggests that as income increases, the likelihood of consumers patronizing locally grown rice decreases, as higher-income consumers may prefer imported or more expensive rice varieties and potentially perceive them as superior in quality. A marginal effect of -0.001 means that for a one Ghana cedi increase in consumer income, the probability of consuming locally produced rice decreases by 0.1%. This result is consistent with the findings of [Twine et al. \(2023\)](#) who reported that lower-income consumers may opt for locally grown rice if it is perceived as more affordable or offers better value-for-money. This is further consistent with the findings of [Ehiakpor et al. \(2017\)](#), [Amfo et al. \(2023\)](#) and [Coffie et al. \(2024\)](#).

The frequency of rice consumption has a positive and significant coefficient. This means that as the frequency of rice consumption increases, the likelihood of purchasing locally grown rice also increases. This relationship suggests that frequent rice consumers are more likely to appreciate the benefits of local rice, possibly due to better taste familiarity, cultural preferences and cost-effectiveness. A marginal effect of 0.002 indicates that, for each additional week, the consumer increases their frequency of consumption, and the probability of purchasing local rice increases by 0.2%. This result is consistent with the findings of [Onwuka et al. \(2010\)](#), [Ogundele \(2014\)](#), [Ajiboye et al. \(2019\)](#) and [Wahyudi et al. \(2019\)](#) who found that the frequency of rice consumption influences the likelihood that consumers prefer to patronize locally grown rice.

4.3. Constraints on consumption or patronage of locally grown rice by consumers

Table 7 lists the various ranked constraints that affect consumer patronage or consumption of locally grown rice. The most significant constraint, “perceived high cost”, received the highest mean score and ranked first, indicating that consumers find Ghanaian rice more expensive than the other alternatives. The second and third challenges identified were “the limited availability of Ghana rice in the market” and “the presence of foreign matter in Ghana rice”, which raised concerns about the quality, purity, consistent supply, and accessibility of locally grown rice. This finding suggests the need for improved distribution, availability, and perceptions to boost consumption. In addition, constraints such as taste, fragrance, branding, advertising, cooking attributes, broken grains, and storage after cooking were identified as significant challenges. These factors collectively create obstacles that affect consumer preferences and choices. These findings are consistent with previous studies by [Danso-Abbeam et al. \(2014\)](#), and [Addison et al. \(2015\)](#), who reported that Ghanaian consumers prioritize favorable pricing and availability when choosing rice types.

Table 7. Constraints on consumption or purchasing of locally grown rice by consumers

Constraints	Mean	Rank
Ghana rice is expensive	2.27	1st
Ghana rice is not readily available	2.43	2nd
Ghana rice is full of foreign matter	2.98	3rd
Ghana rice is not tasty or palatable	4.88	4th
Ghana rice has poor fragrance/aroma	5.03	5th
Ghana rice is not well-branded	6.85	6th
Ghana grown rice is not well advertised (not well known to me)	7.40	7th
Ghana rice has poor cooking attributes	7.50	8th
Ghana rice has many broken grains	5.64	9th
Ghana rice stores bad after cooking	6.40	10th
Number of observations = 120		
Kendall's $W^a = 0.661$		
Chi-Square = 731.867		
Df = 9		
P-value = 0.000		

Source: Field survey, 2023

These constraints are parallel to those identified in rice consumption, particularly regarding price, limited market availability, and concerns about foreign matters in Ghana-grown rice. Kendall's coefficient of concordance ($W^a = 0.661$) suggests a moderate agreement among consumers regarding the ranking of these challenges. This indicates a consensus

on the severity and importance of barriers to consuming or patronizing Ghana-grown rice. The high chi-square value (731.867) and significant p-value (0.000) confirm the statistical significance of the results, indicating that differences in rankings are unlikely to be due to chance. This strong consensus underlines the reliability of the identified constraints related to the patronage or consumption of locally grown rice.

5. Conclusion and Recommendations

This paper examined consumer patronage of locally grown rice in the Kumasi Metropolis, Ghana. The results reveal that consumers prioritize cooking quality palatability, colour, and fragrance as the key attributes that influence preferences for patronizing locally grown rice. Consumers thus prioritize sensory and culinary qualities, suggesting that locally grown rice can effectively compete with imported rice varieties by focusing on these attributes. The probit analysis identified income and the frequency of rice consumption as key determinants influencing consumers' preferences for purchasing locally grown rice. These findings highlight the potential roles of familiarity, cultural preferences, and cost-effectiveness in shaping consumer behavior towards local rice. Major constraints to patronizing Ghana grown rice are the perceived high cost, limited availability of rice, and quality of locally grown rice.

Boosting the consumption of domestically grown rice calls for strengthening the rice value chain to enhance their performance. Based on key the findings, this paper recommends that stakeholders within the rice value chain including producers, processors, government agencies and NGOs should aim at developing a more competitive rice value chain increasing through yields, output and marketing. Adopting improved varieties with preferred attributes (cooking quality, palatability, colour, and fragrance) and application of good agricultural practices, quality control at postharvest during processing can boost yields and make Ghana-grown more rice attractive to consumers. To ensure wider patronage, deliberate marketing strategies and campaigns needs to be intensified as more and more Ghanaians continue to align with the shifting patterns in food systems, especially living standards improve. However, it is important to note that the probit model used in this study has limitations. As indicated by the chi-square value of the likelihood ratio and pseudo-R-square value, the model fit is weak; however, the results provide valuable insights into consumer behavior and rice purchasing decisions. Given the exploratory nature of the study, future research should include larger sample sizes, additional factors, or variables, and refine the model for greater explanatory power.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability statement

Data associated with this study has not been deposited into a publicly available repository however, the data will be made available on request.

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