PUBLIC PERCEPTION AND WILLINGNESS TO PAY FOR PROGARI IN THE BONO AND GREATER ACCRA REGIONS OF GHANA

Abstract

Cassava is one of the most important staple crops in the tropics, ranking just behind rice and maize as a major source of calories. Its processed products are rich in carbohydrates, with gari being one of the most popular due to its extended shelf life. proGARI, a scientifically fortified version of gari, was developed under hygienic conditions at the Ghana Atomic Energy Commission (GAEC) to provide enhanced nutritional benefits. To assess consumer perception and willingness to pay for proGARI, a comprehensive survey was conducted in the Bono and Greater Accra Regions using structured questionnaires. The results revealed that nearly 70% of respondents expressed a willingness to purchase proGARI, but suggested improvements in the product's color to increase its visual appeal and marketability. Based on these findings, it is recommended to enhance proGARI's color, implement targeted marketing campaigns highlighting its nutritional value and hygienic production, and expand consumer awareness through education programs. Additionally, offering diverse packaging options, exploring broader regional markets, continuously improving the product based on consumer feedback, and collaborating with retailers to enhance distribution channels are essential strategies to boost proGARI's market presence and consumer demand.

Keywords: Cassava, *Manihot esculenta*, Progari, Public perception, Nutritional value, Ghana

1.0 Introduction

Cassava (*Manihot esculenta Crantz*) is a vital food crop that was introduced to tropical Africa from the New World, and today it plays a significant role in global food security (Blench, 2014). Historically, cassava has been an important staple in the diets of various societies in the Americas, dating back to the 18th century (Charrier & Lefrèvre, 1994). As a woody perennial plant reaching heights of 1–3 meters, cassava belongs to the genus *Manihot* and the family Euphorbiaceae (Bombily, 1995). There are hundreds of cassava varieties cultivated worldwide, with Africa contributing nearly half of the global production (Laure, Pinton, & Second, 1998). Cassava is cultivated in over 40 African countries, making it one of the continent's most important crops.

Cassava ranks as the third most important source of calories in the tropics after rice and maize, underscoring its importance to food security (Fakuda, 2015). Processed cassava products are rich in carbohydrates, particularly starch, and contain valuable minerals (Guira, 2017). Additionally, cassava leaves are a source of protein, vitamins A and C, and essential minerals (Latif et al., 2015). Industrially, cassava is used in a wide array of products, including ethanol, starch, biofuel, flour, and baked goods, making it a versatile and economically significant crop (Echebiri & Edaba, 2008). In many African countries, cassava is consumed in various forms, including *gari*, *attieke*, *tapioca*, and *lafun*, among others (Westby, 2002; Echebiri & Edaba, 2008; Diallo et al., 2013).

1.1 Economic Importance of Cassava

The economic significance of cassava cannot be overstated. Cassava contributes billions in income to both rural households and national economies, making it a key crop for food security across many African nations (FAO, 2012). For instance, in Burkina Faso, cassava has long been a solution to household food insecurity during periods of food shortages. It is now cultivated year-round, thanks to improved irrigation practices and adapted varieties (Guira, 2017). The fermentation technologies used in processing cassava products, particularly *attieke*, are expanding its utility and increasing production. According to Data Bridge Market Research, the cassava market, valued at approximately $175.9 billion, is projected to reach $254 billion, with a CAGR of 5.40% by 2031. The price per ton of cassava depends on quality, location, and processing. Raw cassava could range from $100-$300, with processed products fetching much more (Anonymous, 2024).

Cassava has a history of providing a reliable food source during times of drought and food scarcity in Africa. For example, it was introduced to the Democratic Republic of Congo as a famine-reserve crop in the 16th century by Portuguese traders from Brazil (Okigbo, 1980). Initially, cassava was produced mostly for home consumption, but over time it became a more commercial crop, providing families with an essential food source during periods of hardship, such as droughts or locust invasions (Hillocks, 2002).

Currently, Africa produces about half of the world's cassava, with major contributions from Nigeria, the Congo, and Tanzania (IFAD & FAO, 2000). In many African countries, cassava is either a primary or secondary food staple, providing significant calories per capita. In the Congo, for example, cassava contributes more than 1,000 calories per person per day (Nweke et al., 2004). Given its drought tolerance and adaptability to various environments, cassava plays a crucial role in food security across regions with degraded soils, unpredictable rainfall, and weak market infrastructure (Colding & Pinstrup-Anderson, 2000).

1.2 Socio-Economic Challenges in Africa and Cassava's Role

Africa's socio-economic challenges, such as civil strife, poverty, and unstable political regimes, have made food security a critical issue. Around three-quarters of Africa's poor population rely on agriculture for their livelihood, making the role of crops like cassava in food security all the more important (Donnelly et al., 2005). Africa's population is expected to double by 2020, and the urban population is growing rapidly, placing additional pressure on food production systems (World Bank, 1999).

Maize has traditionally been Africa's most important food crop, but it is highly vulnerable to the region's unpredictable rainfall. In contrast, cassava is a more resilient crop, thriving in drought conditions and degraded soils, making it an important alternative to maize in many regions (Blackie, 1990; Byerlee & Eicher, 1997). Cassava's adaptability has helped it play a famine-prevention role in Eastern and Southern Africa, where recurrent drought has made maize cultivation difficult (Hillocks, 2002).

1.3 Cassava's Economic Potential and Utilization in Ghana

Cassava is a staple food in Ghana, where its importance has grown steadily due to its adaptability and ease of cultivation. In Ghana, cassava has become a key substitute for other starchy crops like yam and plantain in the preparation of traditional foods such as *fufu*, a common meal in the country's forest zones (FAO, 2012). The labor-intensive nature of yam cultivation, along with

cassava's ability to grow on marginal lands, has made it a more affordable and widely available alternative (Guira, 2017).

One of the main products derived from cassava in Ghana is *gari*, a fermented, roasted cassava product that is widely consumed across West Africa (Nweke et al., 2004). Recently, a fortified version of *gari* has been developed by the Ghana Atomic Energy Commission (GAEC), containing added protein and iron to enhance its nutritional value. This fortified *gari*, known as proGARI, aims to address malnutrition and improve food security in Ghana. However, the key challenge remains in understanding how the public perceives this fortified product and whether they are willing to pay for it.

1.4 Objectives of the Study

The primary objective of this study is to assess consumers' perceptions of proGARI and to evaluate their willingness to pay for it. Understanding consumer behavior toward proGARI will provide insights into its market potential and inform strategies for promoting its consumption. Specifically, the study seeks to:

1. Ascertain consumer awareness and perceptions of the nutritional benefits of proGARI.
2. Evaluate the factors influencing consumer willingness to pay for the fortified product.
3. Explore the socio-economic characteristics of consumers that impact their purchasing decisions for proGARI.

Through this research, the study aims to contribute to the broader conversation on food security, nutrition, and market development for fortified foods in Ghana and beyond.

2.0 Methodology

This section outlines the research design, data collection methods, and analytical techniques employed to assess consumers' perceptions and willingness to pay (WTP) for proGARI. A mix of quantitative and econometric methods were applied to ensure a robust analysis, capturing consumer behavior and consumption patterns.

2.1 Data Collection

To gain insights into consumer preferences and WTP for proGARI, structured questionnaires were distributed in Sunyani (Bono Region) and Accra (Greater Accra Region). These regions were chosen to represent both rural and urban settings, ensuring the diversity of socio-economic backgrounds among the respondents. The choice of these regional capitals was strategic, as they feature varying levels of consumer awareness, income distribution, and food consumption habits (Gyimah-Brempong, 1987).

Data collection employed a combination of simple random selection and the snowball sampling approach. Simple random selection ensured that each participant in the study population had an equal chance of being included, thus minimizing selection bias (Etwire et al., 2013). The snowball technique was used to increase the sample size, particularly in areas where respondents were hard to reach, as it relies on referrals from initial respondents to recruit further participants (Goodman, 1961; Heckathorn, 2011). This method proved useful for accessing diverse consumer segments, particularly in densely populated areas of Accra and the peri-urban communities of Sunyani.

The survey collected a range of variables, including respondents' demographic characteristics (such as age and household size), gari consumption patterns (including frequency and type of gari consumed), and weekly purchasing behavior. Gathering this data enabled the study to explore how socio-economic factors influence purchasing decisions and consumption behavior related to

proGARI (Awunyo-Vitor, 2012). For instance, information on household size and consumption patterns is critical in understanding the household demand for food products, which plays a vital role in assessing the potential market for proGARI (Akoto, Appiah & Anaman, 2020).

2.2 Willingness to Pay (WTP) Analysis

To evaluate consumers' willingness to pay (WTP) for proGARI, the study applied econometric models that are suitable for dealing with consumer behavior and monetary decisions. Specifically, a **double-hurdle model** was employed, consisting of a **probit model** and a **tobit model**. These models are particularly well-suited to examining situations where consumers make two decisions: first, whether or not they are willing to pay for a product, and second, how much they are willing to pay (Cragg, 1971; Wooldridge, 2010).

2.3 Probit Model

The probit model was used to analyze the binary decision of whether a consumer is willing to pay for proGARI. This model is ideal for understanding the factors that influence a yes/no decision. Independent variables such as age, household size, income level, and educational background were included in the model to explore their impact on consumers' willingness to pay. The general probit model takes the form:

P(Y=1)= represents the probability that a consumer is willing to pay (WTP)

X denotes a vector of independent variables (such as age, income, and household size) which might influence a consumer's WTP.

β represents the vector of coefficients associated with each independent variable in XXX. Each coefficient in β\betaβ indicates the strength and direction of the effect that the corresponding variable in XXX has on WTP.

Φ(X′β) is the cumulative distribution function (CDF) of the standard normal distribution. The probit model uses Φ the normal CDF, to link the linear combination $X^i\beta$ to the probability P(Y=1), which keeps the output within the range [0,1]. The probit model, as outlined by Wooldridge (2010), provides a way to examine how demographic factors influence WTP by observing the significance and magnitude of coefficients in β. This is useful for identifying which factors (age, income, etc.) have a statistically significant effect on a consumer's willingness to pay.

2.4 Tobit Model: After identifying whether consumers are willing to pay, the tobit model was employed to examine the extent of their WTP. The Tobit model is commonly used for situations where the dependent variable Y is censored. For instance, it applies when we observe Y only if it falls within a certain range (e.g., non-negative values), and unobserved values below or above this range are censored at a limit.

The general form of the Tobit model can be expressed as:

Yi∗=Xi′β+ϵi

where:

Yi∗ is the latent (unobserved) dependent variable, representing the true underlying value we want to model.

Xi is a vector of independent variables for the iii-th observation.

β is a vector of coefficients associated with the variables in X.

ϵi represents the error term, which we assume to be normally distributed with mean zero and constant variance σ2.

2.4.1 Censoring Rule

The observed dependent variable Yi relates to Yi∗ Yi∗ as follows:

$$Y = \begin{cases} Y^* \; if \; Y^* > 0 \\ 0 \; if \; Y^* \leq 0 \end{cases}$$

This means:

If Y_i^* i>0, we observe Y_i directly as $Y_i = Y_i^*$.

If $Y_i^* \leq 0$ Y_i is censored at 0, and we observe $Y_i = 0$.

2.6 Estimation of the Tobit Model

To estimate β in a Tobit model, we use maximum likelihood estimation (MLE), which takes the censoring into account by modifying the likelihood function.

The Tobit model provides insights into the degree of consumer willingness to pay for proGARI, particularly important for pricing and market entry strategies (Maddala, 1983).

By combining the probit and Tobit models into the double-hurdle framework, the study offers a comprehensive view of both the decision-making process and the extent of WTP. This approach ensures that both the likelihood of market entry and potential revenue from proGARI are accurately assessed.

3.0 Results and Discussion

3.1 Socioeconomic Characteristics

Socioeconomic characteristics play a critical role in consumer preferences and purchasing behavior. Understanding the community context, gender distribution, marital status, and other demographic factors helps paint a clearer picture of the target market's preferences and their likelihood of adopting new products like proGARI. According to Asenso-Okyere et al. (1997), socioeconomic characteristics significantly influence consumption patterns and decision-making processes in both urban and rural areas. The data collected in Sunyani and Accra provides insights into these variables, and the following subsections elaborate on the key findings from the survey.

3.1.1 Community, Gender, and Marital Status

The survey was conducted in two major cities in Ghana, Sunyani and Accra, with equal numbers of respondents from each location (179 respondents from Accra and 179 from Sunyani). Specific communities like Penkwasi contributed 16.5% (60 respondents), while the rest came from areas like Haatso (25.4%) and GAEC (17.4%). Community-specific factors, such as local market structures and cultural norms, can influence consumption patterns (Fafchamps & Shilpi, 2003). Gender distribution and marital status were not explicitly mentioned but are important variables in similar studies, as they influence household spending and product choice (Hoddinott & Haddad, 1995).

3.1.2 Gari Consumption and Frequency of Consumption

Gari, a popular staple in many Ghanaian households, was consumed by the majority of respondents, with 96.64% (345 respondents) stating that they consume gari. The frequency of consumption varied, with 72.17% consuming gari once a week, 11.88% consuming it twice a week, and 15.95% consuming it more than twice a week. This pattern aligns with findings by Boateng et al. (2017), which show that staple foods like gari are consumed frequently in urban areas due to their affordability and versatility in meals.

3.1.3 Where Do You Buy Your Gari?

In line with common market trends, most respondents (71.40%) purchased their gari from market centers, 12.14% from supermarkets, and 13.60% from street vendors. Market centers are often the primary source of staple food products in Ghana, especially in low-income communities (Abbott, 2003). The smaller percentage buying from supermarkets reflects the gradual penetration of modern retail outlets, while street vendors remain a significant source due to convenience and price flexibility.

3.1.4 Factors Considered When Buying Gari

The survey revealed that 41.50% of respondents prioritized the neatness of the gari when making their purchasing decisions. This finding is supported by studies such as Omotayo et al. (2020), which indicate that product cleanliness and appearance are significant factors influencing food purchases in developing countries. Price, particle size, and environmental factors were also mentioned by a notable portion of respondents (33.57%), indicating the multifaceted nature of consumer decision-making.

3.1.5 Awareness of Different Gari Types

About 58.33% of respondents were familiar with various types of gari, including CSIR gari, smooth, rough, dry, proGARI, and local white gari. Product differentiation in the gari market is minimal, but awareness of different varieties, such as white and yellow gari, suggests that consumers have a preference based on either regional origin or processing methods (Aidoo et al., 2009). The knowledge of specialty gari types like Angloga and Asante gari by 7.32% of respondents suggests that regional identity plays a role in consumer choices.

3.1.6 Preferred Gari Type

Nearly half of the respondents (49.76%) reported that they often purchase white gari, a popular choice in many households due to its versatility in meals. The preference for yellow gari by 8.30% and other specialty types (Angloga, Asante, Ivorian) by 41.94% indicates that certain consumers may seek out gari types based on texture, color, or perceived quality (Abdoulaye et al., 2015). This aligns with market segmentation theories that highlight how consumer preferences are shaped by product characteristics and cultural factors (Kotler & Keller, 2016).

3.1.7 Awareness of proGARI

The survey found that 91.04% of respondents had not heard of the new gari brand, proGARI, while only 8.96% were familiar with it. This low level of awareness reflects the challenges new products face in entering established markets, especially when traditional products dominate consumer preferences. According to Aaker (1996), brand awareness is a key driver of product adoption, and the low recognition of proGARI suggests that more marketing efforts are needed to penetrate the market.

3.1.8 Taste, Color, and Flavor of proGARI

Among those who sampled proGARI, 69.23% reported that it had a good taste, while 21.08% were indifferent. In terms of color, 50.00% made positive comments, while 35.14% had negative perceptions. Flavor was viewed positively by 64.10%, but 15.38% did not like it. Consumer

preferences for sensory characteristics such as taste, color, and flavor are critical in food products (Cardello, 1994). The mixed reactions to proGARI highlight the importance of sensory appeal in gaining consumer acceptance for new food products.

3.1.9 Willingness to Pay (WTP)

The survey revealed that 86.04% of respondents were willing to pay for proGARI, with a maximum WTP of GH¢50.00 and a minimum of GH¢2.00. The mean WTP was GH¢17.5 ± GH¢12.1, showing significant variation in consumer valuation. Willingness to pay for new food products is often influenced by factors like perceived quality, price, and brand familiarity (Mitchell & Carson, 1989). This relatively high WTP suggests that, despite the low awareness of proGARI, there is potential for its acceptance if consumers perceive added value in the product.

3.20 Age of Respondents

The respondents ranged in age from 18 to 72 years, with a mean age of 37.2 ± 12 years. Age is a significant factor in consumer behavior, as older consumers may have different preferences or spending patterns compared to younger consumers (Homburg & Giering, 2001). The relatively young mean age of respondents suggests that proGARI could appeal to a younger, more open-to-experimentation demographic, which may positively influence its market adoption.

Table 1 Mean, Minimum and Maximum values of some socioeconomic variables

Variable	Obs	Mean	Std. Dev.	Min.	Max.
Howmuchdoy-s	333	5.022523	8.472951	0	50
Howmuch to pay for 10% benefit	345	9.821739	4.390558	2	50
Howmuch to pay for 20% benefit	312	9.841346	4.553857	0	30
Howmuch to pay for 50% benefit	312	9.841346	4.553857	0	30
Howmuch to pay for 100% benefit	312	14.04167	8.942197	0	100
maxWTP inGH-s	307	17.56026	12.06676	0	101
Age in years	353	37.27479	11.99223	18	72
Years of schooling	348	13.62931	4.112671	0	24

3.2.1 Amount Spent in Ghanaian Cedis

Consumer spending behavior is often influenced by income levels, preferences, and product perceptions. According to Deaton and Muellbauer (1980), consumer demand varies with changes in price and income, and spending patterns often exhibit significant variability, especially in low- to middle-income settings. The observed mean spending of 5.02 Cedis, with a wide standard deviation of 8.47 Cedis, aligns with existing literature on the disparity in consumer expenditure in emerging economies (Deaton & Muellbauer, 1980). Moreover, studies by Abdulai and Huffman (2000) emphasize that variations in spending often reflect differences in income levels, household composition, and preferences, which may explain the observed range in your data.

3.2.2 Willingness to Pay for a 10% Benefit

Willingness to pay (WTP) is commonly used to evaluate consumer demand for product benefits. Hanemann (1991) posits that consumers' WTP is often determined by their perceived utility from the product. The average WTP of 9.82 Cedis for a 10% benefit, with moderate variability (standard deviation of 4.39 Cedis), supports this theory, as consumers may assign varying values to incremental benefits based on their needs and economic circumstances (Hanemann, 1991). This

finding is consistent with the work of Mitchell and Carson (1989), who found that consumer WTP for product improvements or benefits often varies across individuals due to factors like income, education, and personal preferences.

3.2.3 Willingness to Pay for a 20% Benefit

The consistency in WTP for a 20% benefit (mean of 9.84 Cedis) with moderate variability supports findings from empirical studies such as those by Louviere et al. (2000). According to Louviere et al., individuals often express relatively stable preferences for incremental product benefits, which may explain why the mean WTP remains similar between the 10% and 20% benefits. Furthermore, willingness to pay studies, like those conducted by Blamey, Bennett, and Morrison (1999), suggest that perceived marginal utility of benefits often plateaus, leading to minimal changes in WTP across small increments in benefits.

3.2.4 Willingness to Pay for a 50% Benefit

The findings for a 50% benefit (mean WTP of 9.84 Cedis) and moderate variability (standard deviation of 4.55 Cedis) align with research by Carson and Hanemann (2005). They argue that for significant benefit increases, individuals may not proportionally increase their WTP due to diminishing marginal utility. This phenomenon, widely supported in economic theory, explains why respondents may not exhibit significantly higher WTP despite a large increase in the benefit level (Carson & Hanemann, 2005).

3.2.5 Willingness to Pay for a 100% Benefit

For the 100% benefit, with a higher mean WTP of 14.04 Cedis and greater variability (standard deviation of 8.94 Cedis), studies by Bateman et al. (2002) provide a fitting explanation. They highlight that as the benefit size increases, individuals' WTP becomes more variable, reflecting a broader range of perceived value. This aligns with the finding that the range of WTP spans from 0 to 100 Cedis, indicating that different individuals place vastly different values on a complete benefit (Bateman et al., 2002).

3.2.6 Maximum Willingness to Pay in Ghanaian Cedis

The mean maximum WTP of 17.56 Cedis, with a wide range from 0 to 101 Cedis and a standard deviation of 12.07 Cedis, is consistent with research on the upper limits of consumer expenditure. Studies by Cameron and James (1987) on contingent valuation methods suggest that maximum WTP often shows significant variability, as individuals have different thresholds for what they consider affordable or worth paying. This finding also corresponds to research by Champ, Boyle, and Brown (2003), who found that maximum WTP often reflects the consumer’s budget constraint and the perceived value of the product or service.

3.2.7 Age of Respondents

Age is often a critical factor in consumer behavior and WTP studies. According to Homburg, Koschate, and Hoyer (2005), age impacts not only purchasing power but also preferences and perceptions of value. In this dataset, with a mean age of 37.27 years and a standard deviation of 11.99 years, the findings align with broader research suggesting that middle-aged individuals tend to be the most active consumers, often willing to spend more compared to younger or older individuals, due to their peak earning capacity (Homburg et al., 2005).

3.2.8 Years of Schooling

The mean years of schooling (13.63 years) reflect a relatively well-educated sample, which could explain the informed decision-making processes highlighted in the data. The literature suggests that higher educational attainment correlates with greater awareness and better decision-making abilities (Schultz, 1961). The variability in schooling (standard deviation of 4.11 years) aligns with findings by Psacharopoulos and Patrinos (2004), who show that educational attainment is a key determinant of both earning potential and consumer behavior.

3.2.7 Summary of Key Variables

The observed data on consumer spending, willingness to pay, and demographic variables fit within the broader framework of economic theories on consumer behavior. Studies by Kotler and Keller (2016) emphasize the importance of understanding consumer preferences, willingness to pay, and demographic influences for effective market segmentation and product pricing. The variability observed in each category further supports the notion that diverse factors, such as income, education, and age, play significant roles in shaping consumer decisions (Kotler & Keller, 2016).

Table 2 Willingness to Pay- first hurdle

WtpdummyproGARI	Coef.	Std. Err.	Z	P>|z|
Gendmmy	0.117714	0.7326534	0.16	0.872
Age in years	0.397686	0.0312622	1.27	0.203
Year of schooling	-0.184894	0.1069157	-1.73	0.084
Marital status dmmy	0.1476712	0.6210541	0.24	0.812
How much you buy in Gh cedis	0.1511247	0.0612002	2.47	0.014
Gari type dummy	0.0194357	0.6903325	0.03	0.978
Wtp in GH Cedis for20% improvement	-4.375181	439.2648	-0.01	0.992
100 improvement in GH cedis	4.575895	439.4648	0.01	0.992
Cons	0.2198147	1.713908	0.13	0.898

3.3 Detailed Analysis of Regression Results- Willingness to pay hurdle 1

The lack of statistical significance for the gender dummy variable (p-value = 0.872) indicates that gender does not influence the willingness to pay for proGARI in this sample. This result contrasts with other studies where gender differences have been observed in consumer behavior (Blench, 2014). For instance, research often finds women may have different food preferences and spending patterns compared to men (Guira, 2017). However, in this study, it seems that gender does not play a significant role in the valuation of the fortified gari, possibly due to uniform product perception across genders or the specific context of the product in the market (Nweke et al., 2004).

The age variable also shows a lack of statistical significance (p-value = 0.203). This suggests that the willingness to pay for proGARI does not vary significantly with the age of the respondent. While age can influence consumer preferences and spending habits (Fakuda, 2015), the results here imply that proGARI's appeal might be consistent across different age groups. This could indicate that the product's features or benefits are perceived similarly regardless of age, or that other factors are more influential in determining WTP (Hillocks, 2002).

The borderline significance of years of schooling (p-value = 0.084) indicates that education might have a weak but noticeable impact on willingness to pay. This aligns with findings that educated consumers are often more aware of health benefits and product quality, which could make them more willing to pay a premium for enhanced products like proGARI (Donnelly et al., 2005). Educational attainment can influence consumer knowledge and preferences, potentially affecting their willingness to invest in products perceived as more nutritious or beneficial (Nweke et al., 2004).

The marital status dummy variable does not have a statistically significant impact on willingness to pay. This suggests that being married or single does not significantly influence consumers' valuation of proGARI. Previous research has shown that marital status can sometimes affect household spending and food choices, but in this case, it appears to have little effect (Colding & Pinstrup-Anderson, 2000). This might indicate that the decision to purchase proGARI is more influenced by other factors such as product features or price rather than marital status.

The significant impact of the amount spent on gari (p-value = 0.014) suggests that consumers who spend more on gari are also more willing to pay for proGARI. This finding is consistent with the notion that higher expenditure on a product often correlates with a greater willingness to pay for related goods (Echebiri & Edaba, 2008). It highlights the importance of existing consumption patterns in shaping consumers' perceptions and willingness to invest in a new or improved product.

The gari type dummy variable does not show a significant effect on willingness to pay, indicating that the specific type of gari consumed by respondents does not influence their valuation of proGARI. This suggests that while different gari types may have varying characteristics, these do not significantly affect willingness to pay for a fortified variant. This could imply that consumers' willingness to pay is driven more by other factors such as price or perceived quality rather than the specific type of gari they typically consume (Westby, 2002).

The lack of statistical significance for willingness to pay for a 20% improvement suggests that moderate enhancements in product quality do not significantly influence consumer valuation. This might indicate that consumers do not perceive a 20% improvement as substantial enough to affect their willingness to pay or that they are already satisfied with the current product quality (Fakuda, 2015).

Similarly, the absence of significance for willingness to pay for a 100% improvement indicates that even a complete overhaul in product quality does not significantly impact consumer willingness to pay. This result may reflect a high baseline valuation of the product or a potential disconnect between perceived and actual improvements (Guira, 2017). It could also suggest that other factors, such as price or brand perception, are more influential than product quality improvements in determining WTP.

The constant term represents the baseline level of willingness to pay for proGARI. Its lack of significance indicates that the baseline willingness to pay, when other variables are held constant, does not significantly differ from zero. This suggests that without considering the influence of other factors, the inherent valuation of proGARI may not be strong (Donnelly et al., 2005).

3.3.1 Summary

The analysis reveals that among the variables considered, only the amount spent on gari in GH cedis has a statistically significant impact on willingness to pay for proGARI. Other factors, including gender, age, marital status, gari type, and willingness to pay for product improvements, do not show significant effects. This suggests that the primary determinant of willingness to pay for proGARI in this sample is existing expenditure on similar products, highlighting the importance of consumer spending patterns in influencing their valuation of new products.

Table 3 Maximum Amount to Pay for proGARI- Second hurdle

maxwtpinGHCedis	Coef.	Std. Err.	T	P>|t|
Gendmmy	-0.4835726	0.5850361	-0.83	0.409
Age	0.0508011	0.0215531	2.36	0.019
Yearofschooling	-0.222662	0.0570703	-3.9	0
Marital status dmmy	-0.2759332	0.6002056	-0.46	0.646
How much do you buy in Gh cedis	0.2525127	0.0370443	1.42	0.157
Gari type dummy	0.1768529	0.59569594	0.3	0.767
Wtp in GH Cedis for 20% improveme	0.084775	0.0811337	1.04	0.297
In GH Cedis for 100 % improvement	1.24162	0.0402795	30.82	0
/sigma	4.831009	0.2039307		

3.4 Detailed Analysis of Regression Results- Extent of willingness to pay hurdle 2

The regression results indicate that age has a statistically significant effect on the maximum price consumers are willing to pay for proGARI. Specifically, for each additional year of age, respondents are willing to pay an extra 5 pesewas (GHS 0.05) for proGARI (p-value = 0.019). This finding aligns with studies suggesting that older consumers may value products differently, possibly due to increased health consciousness or disposable income (Nweke et al., 2004). Older individuals might have a higher willingness to pay for products that they perceive as beneficial for their health or nutrition, reflecting a greater emphasis on health-related attributes in their purchasing decisions (Guira, 2017)

The number of years of schooling is highly statistically significant (p-value = 0.000), indicating a strong impact on the willingness to pay for proGARI. The results show that as years of schooling increase by one unit, the amount consumers are willing to pay decreases by GH¢2.2. This suggests that more educated individuals might be more price-sensitive or possibly better informed about alternative products or the cost-benefit ratio of proGARI (Fakuda, 2015). Education often enhances consumer knowledge, which could lead to a greater focus on cost-effectiveness and value for money, influencing their willingness to pay (Donnelly et al., 2005).

The marital status dummy variable does not show a statistically significant effect on willingness to pay for proGARI (p-value = 0.646). This indicates that marital status does not substantially influence the maximum price respondents are willing to pay. Previous studies have sometimes found that marital status can impact consumer preferences and spending behavior, but in this context, it appears to be less relevant (Blench, 2014). This could suggest that factors other than marital status are more critical in determining willingness to pay for proGARI.

The amount spent on gari in GH cedis does not have a statistically significant impact on the dependent variable (p-value = 0.157). This suggests that the current spending on gari does not significantly affect the maximum amount respondents are willing to pay for proGARI. This result may reflect that consumers' spending on existing gari does not directly translate to their valuation of a fortified product, or that other factors, such as perceived health benefits or product quality, play a more significant role in their willingness to pay (Echebiri & Edaba, 2008).

The gari type dummy variable does not significantly impact the willingness to pay for proGARI. This finding indicates that the specific type of gari consumed does not affect how much respondents are willing to pay for the fortified variant. This could imply that consumers value proGARI based on its nutritional benefits rather than the type of gari they are accustomed to consuming (Westby, 2002).

The willingness to pay for a 20% improvement in proGARI does not show a statistically significant effect (p-value = 0.202). This suggests that moderate improvements in the product do not significantly influence the amount consumers are willing to pay. This result might indicate that consumers perceive the current level of product quality as sufficient or that they do not see a 20% improvement as substantial enough to justify a higher price (Hillocks, 2002).

The willingness to pay for a 100% improvement is highly statistically significant (p-value = 0.000). Consumers are willing to pay GH₵1.2 more if they perceive a complete enhancement in the product's nutritional status. This finding underscores the importance of substantial improvements in product quality for increasing consumer valuation. A full upgrade in product attributes can significantly boost willingness to pay, highlighting that consumers place high value on significant enhancements (Latif et al., 2015).

The constant term represents the baseline level of willingness to pay when all other variables are held constant. Its statistical significance or lack thereof helps understand the starting point of the willingness to pay. In this case, if the constant term is not statistically significant, it suggests that the baseline willingness to pay is not significantly different from zero, and the impact of other variables drives the variation in willingness to pay (Colding & Pinstrup-Anderson, 2000).

3.4.1 Summary

In summary, the analysis reveals that age and years of schooling significantly affect the maximum amount consumers are willing to pay for proGARI, with age increasing willingness slightly and more schooling reducing it. The willingness to pay for a 100% improvement in nutritional quality is also significant, reflecting the high value consumers place on major product enhancements. Conversely, variables such as marital status, the amount spent on gari, gari type, and willingness to pay for 20% improvement do not significantly influence the dependent variable. These insights can inform strategies for pricing and marketing proGARI, focusing on the factors that most impact consumer valuation.

4.0 Conclusions

The survey conducted included 358 participants, evenly distributed between Accra and Sunyani. Respondents hailed from a range of communities, with the largest representation from Penkwasi

(60) and Haatso (87), along with 148 participants from other locations. The data showed that almost all respondents (96.64%) consume gari regularly, with the majority (72.17%) consuming it on a weekly basis.

Market centers emerged as the preferred venue for purchasing gari, with 71.40% of respondents indicating this preference, followed by supermarkets, street vendors, and other sources. The factors that most influenced consumers' purchasing decisions were neatness, price, particle size, seller reputation, and the environment.

More than half of the respondents (58.33%) were aware of different types of gari, such as CSIR gari, proGARI, and local white gari. White gari was the most preferred type, chosen by 49.76% of respondents, while yellow gari followed, selected by 8.30%. However, a large proportion (91.04%) of respondents were unfamiliar with the new proGARI brand. Among the 173 participants who had tried proGARI, opinions on its appearance, texture, taste, color, and flavor were mixed.

A strong majority (86.04%) expressed willingness to pay for proGARI, with an average willingness to pay of GH¢17.5. Descriptive statistics were analyzed for various factors including spending, willingness to pay for different benefit levels, age, and years of schooling.

Regression analysis identified that among the factors considered, "How much you buy in GH cedis" was the only statistically significant factor influencing preferences and willingness to pay for proGARI. Additionally, age, years of schooling, and a 10% improvement in nutrition were found to have a significant impact on the maximum price consumers were willing to pay. However, variables such as gender, marital status, gari type, and certain specific product improvements did not show statistically significant effects in this context.

4.4 Recommendations

Based on the survey findings, the following recommendations are made to increase the market presence and acceptance of proGARI:

1. With a significant portion of respondents (91.04%) unfamiliar with proGARI, a focused marketing and awareness campaign is crucial. The campaign should utilize multiple channels, such as social media, local radio stations, and community events, to inform consumers about proGARI's availability and benefits. Raising awareness could significantly improve proGARI's market penetration.
2. Since over half (58.33%) of respondents are already familiar with other types of gari (CSIR gari, local white gari), it is important to highlight the unique qualities of proGARI. Emphasizing its superior nutritional value and other distinguishing attributes can increase consumer interest, particularly among health-conscious individuals.
3. The survey indicated that opinions on proGARI's appearance, texture, taste, color, and flavor varied. Addressing these diverse preferences by refining the product's visual and sensory attributes will be essential to improving consumer satisfaction. Ensuring consistent quality across batches will also help in building a reliable customer base.
4. Given the average willingness to pay of GH¢17.5, pricing proGARI within this range is important to maintain affordability for a wide spectrum of consumers. Competitive pricing will help proGARI appeal to budget-conscious consumers while ensuring it remains accessible across different income levels.
5. Since the majority of respondents prefer purchasing gari from market centers (71.40%), establishing a strong presence in these locations will be key to driving sales. Building partnerships

with supermarkets and street vendors can further expand proGARI's reach to diverse consumer segments in both Accra and Sunyani.

6. While white gari remains the most preferred type, there is still demand for other varieties, such as yellow gari. By offering a range of gari options, including proGARI, the brand can cater to a broader customer base with diverse preferences, ultimately increasing market share.
7. Ongoing research and feedback collection will be crucial to ensuring that proGARI continues to meet evolving consumer preferences. Regular surveys and focus groups can provide valuable insights for refining both the product and marketing strategies, ensuring that they remain aligned with consumer expectations.
8. Since age, years of schooling, and spending behavior were significant factors influencing willingness to pay for proGARI, targeted marketing efforts should focus on these demographics. Tailoring promotional efforts to appeal to older and more educated consumers could enhance proGARI's appeal among these groups.
9. Monitoring consumer trends and market developments will be vital for proGARI's long-term success. Regularly assessing consumer preferences and adjusting marketing and product strategies will ensure that proGARI remains relevant in a competitive market. Conclusion:
   The survey results offer valuable insights into consumer behavior and preferences regarding gari in Accra and Sunyani. While the findings show a high level of gari consumption and willingness to pay for proGARI, they also highlight the need for increased brand awareness and product refinement. By implementing the outlined recommendations, proGARI can improve its market penetration, enhance consumer acceptance, and establish itself as a competitive product in the gari market.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

5.0 References

1. Aaker, D. A. (1996). *Building strong brands*. The Free Press.
2. Abbott, J. C. (2003). *Agricultural economics and marketing in the tropics*. Oxford University Press.
3. Abdulai, A., & Huffman, W. E. (2000). Structural adjustment and economic efficiency of rice farmers in northern Ghana. *Economic Development and Cultural Change, 48*(3), 503-520.
4. Abdoulaye, T., Abass, A., Maziya-Dixon, B., Tarawali, G., Okechukwu, R., Rusike, J., & Alene, A. (2015). Awareness and adoption of improved cassava varieties and processing technologies in Nigeria. *Journal of Development and Agricultural Economics, 7*(2), 72-80.
5. Akoto, O. Y., Appiah, S. K., & Anaman, P. K. (2020). Household food demand analysis in Ghana. *African Journal of Food, Agriculture, Nutrition and Development, 20*(4), 16394-16410.
6. Aidoo, R., Nimoh, F., Bakang, J. A., Ohene-Yankyera, K., Fialor, S. C., Mensah, J. O., & Abaidoo, R. C. (2009). Estimation of margins and efficiency of some selected retail

marketing channels for cassava products in Ghana. *Journal of Development and Agricultural Economics, 1*(2), 011-018.
7. Asenso-Okyere, W. K., Osei-Akoto, I., Anum, A., & Appiah, E. N. (1997). Willingness to pay for health insurance in a developing economy: A pilot study of the informal sector of Ghana using contingent valuation. *Health Policy, 42*(3), 223-237.
8. Awunyo-Vitor, D. (2012). Determinants of household willingness to pay for improved solid waste management in Ghana. *International Journal of Environmental Science and Technology, 9*(6), 1035-1043.
9. Bateman, I. J., Carson, R. T., Day, B., Hanemann, M., Hanley, N., Hett, T., & Swanson, J. (2002). *Economic valuation with stated preference techniques: A manual*. Edward Elgar Publishing.
10. Blamey, R., Bennett, J., & Morrison, M. (1999). Yea-saying in contingent valuation surveys. *Land Economics, 75*(1), 126-141.
11. Blench, R. (2014). *The history of cassava in Africa*. Cambridge University Press.
12. Blench, R. (2014). *Cassava in Africa: The history, uses, and future potential*. Routledge.
13. Boateng, S., Acheampong, P. P., & Owusu, S. A. (2017). Household consumption patterns in urban Ghana: A study of three districts in Kumasi metropolis. *Journal of Economics and Sustainable Development, 8*(11), 145-152.
14. Bombily, A. (1995). *Cassava: The miracle crop*. Academic Press.
15. Burt, M. G., & Finley, P. (2017). *Farm management: Decision making process*. Pearson.
16. Cameron, T. A., & James, M. D. (1987). Efficient estimation methods for "closed-ended" contingent valuation surveys. *The Review of Economics and Statistics, 69*(2), 269-276.
17. Cardello, A. V. (1994). Consumer expectations and their role in food acceptance. In *Measurement of food preferences* (pp. 253-297). Springer.
18. Carson, R. T., & Hanemann, W. M. (2005). Contingent valuation. In *Handbook of environmental economics* (Vol. 2, pp. 821-936). Elsevier.
19. Charrier, A., & Lefrèvre, F. (1994). Cassava breeding and genetics. CIRAD.
20. Colding, J., & Pinstrup-Anderson, P. (2000). Food security and rural development in Africa. *World Development, 28*(2), 233-244.
21. Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica, 39*(5), 829-844.
22. Deaton, A., & Muellbauer, J. (1980). *Economics and consumer behavior*. Cambridge University Press.
23. Diallo, K., Westby, A., & Edaba, J. (2013). Cassava processing in Africa: Challenges and prospects. *Food Science and Technology International, 19*(1), 98-105.
24. Donnelly, D., et al. (2005). The future of cassava in Africa. *African Journal of Agricultural Economics, 32*(1), 29-40.
25. Donnelly, T., et al. (2005). Population dynamics and rural development in Africa. *Development Studies Research, 21*(1), 45-58.
26. Echebiri, R. N., & Edaba, M. E. (2008). Production and utilization of cassava in Nigeria: Prospects for food security and infant nutrition. *African Development Review, 20*(3), 1-12.
27. Echebiri, R. N., & Edaba, J. (2008). The role of cassava in food security and nutrition. *Journal of Agriculture and Rural Development, 10*(3), 45-56.
28. Etwire, P. M., Dogbe, W., & Martey, E. (2013). Determinants of household willingness to pay for a new insecticide-treated mosquito net in northern Ghana. *International Journal of Social Economics, 40*(6), 531-543.

29. FAO. (2012). *Cassava: A vital crop for food security in Africa*. FAO.
30. Fakuda, A. (2015). Cassava as a major source of calories in the tropics. *Tropical Agriculture, 92*(3), 219-230.
31. Fakuda, W. (2015). Cassava as a critical crop in global food security. *Journal of Agricultural Development, 43*(2), 11-18.
32. Fafchamps, M., & Shilpi, F. (2003). The spatial division of labor in Nepal. *Journal of Development Studies, 39*(6), 23-66.
33. Goodman, L. A. (1961). Snowball sampling. *Annals of Mathematical Statistics, 32*(1), 148-170.
34. Guira, A. (2017). Economic impacts of cassava production and processing in West Africa. *African Journal of Agricultural Research, 12*(5), 45-56.
35. Hanemann, W. M. (1991). Willingness to pay and willingness to accept: How much can they differ? *The American Economic Review, 81*(3), 635-647.
36. Heckathorn, D. D. (2011). Comment: Snowball versus respondent-driven sampling. *Sociological Methodology, 41*(1), 355-366.
37. Hillocks, R. J. (2002). Cassava in Africa: Importance and prospects. *Outlook on Agriculture, 31*(4), 207-214.
38. Hoddinott, J., & Haddad, L. (1995). Does female income share influence household expenditures? Evidence from Côte d'Ivoire. *Oxford Bulletin of Economics and Statistics, 57*(1), 77-96.
39. Homburg, C., & Giering, A. (2001). Personal characteristics as moderators of the relationship between customer satisfaction and loyalty—an empirical analysis. *Psychology & Marketing, 18*(1), 43-66.
40. Homburg, C., Koschate, N., & Hoyer, W. D. (2005). Do satisfied customers really pay more? A study of the relationship between customer satisfaction and willingness to pay. *Journal of Marketing, 69*(2), 84-96.
41. IFAD & FAO. (2000). *The world cassava economy: Facts, trends and outlooks*. FAO.
42. Kotler, P., & Keller, K. L. (2016). *Marketing management* (15th ed.). Pearson.
43. Latif, S., et al. (2015). Nutritional value of cassava leaves. *Journal of Food Science, 80*(9), 2096-2102.
44. Laure, B., Pinton, S., & Second, G. (1998). Cassava genetic resources. *Plant Breeding Reviews, 16*, 317-347.
45. Lorenzen, J., et al. (2010). Cassava in the world: Production trends and genetic resources. *Journal of Agricultural Research, 11*(3), 214-230.
46. Lyocks, J. S., & Ugbah, M. M. (2014). Marketing margins for cassava in Nigeria: Implications for food security. *Journal of Agricultural Economics, 67*(5), 145-162.

Anonymous, 2024. Cassava Business in Africa: A Lucrative Investment Opportunity. Accessed from internet https://africaforinvestors.com/, Nov 2024.