



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

A CONJOINT ANALYSIS OF MALAYSIAN CONSUMER PREFERENCES FOR IMPORTED RICE ATTRIBUTES

Yah-ya IbrahimAbubakar

Universiti Putra Malaysia, Department of Agribusiness and Information Systems,
Faculty of Agriculture, 43400 Serdang, Selangor, Malaysia.
Email: yah-ya.abubakar20@kwasu.edu.ng, ORCID: 0009-0007-9401-3601.

Golnaz Rezai

Universiti Putra Malaysia, Department of Agribusiness and Information Systems,
Faculty of Agriculture, 43400 Serdang, Selangor, Malaysia,
ORCID: 0000-0003-2944-250X

Mad Nasir Shamsudin

Universiti Putra Malaysia, Department of Agribusiness and Information Systems,
Faculty of Agriculture, 43400 Serdang, Selangor, Malaysia.
ORCID: 0000-0003-3637-1367

Zainalabidin Mohamed

Universiti Putra Malaysia, Department of Agribusiness and Information Systems,
Faculty of Agriculture, 43400 Serdang, Selangor, Malaysia.
ORCID: 0000-0001-7619-5746

Abstract

Rising incomes and urbanization in Malaysia have shifted consumer preferences toward higher-quality food. As a result, rice imports have grown not only to bridge supply gaps but also to meet demand for superior varieties not cultivated locally. This study investigated Malaysian consumers' preferences for these alternative attributes of imported varieties that are now pervasive in the market. The study consisted of 500 consumers from 3 income groups; group 1 (<600 USD), group 2 (600-1200 USD) and group 3 (>1200 USD). Conjoint analysis was employed to estimate the key attributes influencing consumer rice preferences in each group and their corresponding willingness to pay. Accordingly, price was found to be the most critical factor influencing consumer preferences across all groups. For non-price attributes, Group 1 prioritizes texture, followed by taste, grain size, aroma and colour; group 2 prefers grain size, followed by texture, taste, aroma and colour; and group 3 prioritizes grain size followed by texture, aroma, taste and colour. These findings indicated that preferences for rice attributes varies across consumer groups, yet they are all want to pay for premium rice. Therefore, Investment in research and development for high-quality domestic varieties is essential to meet consumers' demand, and boost local farmers' profits.

Keywords: *Consumer Preferences, Rice Attributes, Conjoint Analysis, Willingness to Pay and Rice Import.*

Jel Codes: *D12, Q13.*

1. Introduction

Rice is the most important staple food for Malaysians (Abubakar et al, 2015). Despite the introduction of other food items, it retains its position as the major source of calorie in the country. Rice importation is expected to decline as production rises over the years, however, the country remains a primary importer among the Southeast Asia's rice producing nations (Rajamoorthy et al, 2015, Rahim et al., 2017;). Roughly a third of domestic rice consumption is imported on a yearly basis not only to ameliorate supply gap but to fulfil the various type of culinary tastes of the multiracial society while also satisfying consumers demand for varieties not produced locally (Samat et al., 2022; BERNAS, 2023). The amount of foreign exchange expended on rice importation has surged in recent years, as an increase in the levels of income has led to a demand for better quality rice rather than a proportional increase in quantity. In response, Malaysian government announced the development of hybrid varieties with characteristic similar to those of the imported ones (Engku et al., 2019; Dorairaj & Govender, 2023).

The county's past volume-based rice improvement programs have foster importation in meeting the luxury desired by consumers as demand rises for premium rice. When a nation's market chain is driven by quantity rather than quality, the rice seldom attains the highest grades, leading to reduced benefits for the farmers (Fitzgerald, 2010). Given the multitude of imported varieties in the market, it becomes necessary to explore what factors influence preferences for imported rice from consumers' perspective particularly in this epoch of rapid growth in prosperity and urbanization. This is crucial for marketing initiative and establishing benchmark for subsequent rice grain improvement programs aimed at enhancing competitiveness with imported rice and ultimately reducing the cost of rice importation (Engku et al., 2019).

This study applies conjoint analysis, a technique suited for studying consumer's choice process among products with two or more attributes. It estimates the utility (part-worths) attached to each level of attribute, where the aggregate satisfaction an individual obtain from a product is the cumulative amount of all the satisfactions provided by each level of attributes that makes up the product. Since its first application in marketing research by Green and Rao, 1971, it has evolved into a key marketing methodology with broad adaptation in marketing research studies (Rao, 2014). Conjoint analysis has been used to study several food products; chocolate and sugar substitute chocolate (De Pelsmaeker et al., 2017); Fresh tomato (Adegbola et al., 2019); Italian Cheese (Sampalean et al., 2020); food packaging (Arboretti & Bordignon, 2016); Processed tomato packaging (Oenning et al, 2018); Yoghurt packaging design (Wang et al., 2022); Alternative grains (Gosine , & McSweeney, 2019); Rice attributes (Walisinghe & Gunaratne, 2012); beef and broiler attributes (Hanis et al, 2013) etc. As far as we know, no study has specifically focused on the attributes of imported rice varieties in Malaysia, making this research crucial for future rice grain improvement programme.

In this paper, the following section highlights the methods employed in this research. Empirical findings are outlined and explained. After that, willingness to pay was determined among the income groups and finally, the conclusions are presented.

2. Methods

A focus group session was held in ampang park, Malaysia. The purpose was to determine factors that influences imported rice purchase and consumption and as well as to gain insight into the commonly consumed imported rice varieties which can be employed to define the attributes and levels for the study. About 40 respondents were selected from Universiti Putra Malaysia and were interviewed with a pilot questionnaire. The questionnaire consisted basically of the CA type questions so as to be certain that the respondents comprehend and

complete them in the right manner. The final sample consisted of 500 respondents which were systematically selected from Klang valley area of Malaysia. Special attention was paid to the various selected areas to ensure proportionate representation of relevant income groups. In the first section, information was gathered about factors consumers felt influenced their purchasing and consumption of imported rice. This is to ensure that the attributes included in the CA reflect those that consumers consider crucial in the purchase and selection of rice in the market. The second section consisted of the CA questions and last section collected information about respondents' demographics such as gender, race, residential area, age, education level and income.

There are 5 steps in the conduct of a conjoint study (Van der pol et al, 1996)

- (1) Attributes identification and Selection
- (2) Specifying the attribute levels.
- (3) Selecting the appropriate context to show the respondents.
- (4) Developing preferences.
- (5) Evaluating aggregate and marginal utilities as well as the rate of trade-off between attributes and willingness to pay, if cost constitutes part of the attributes.

2.1 Selection of Attributes

Selection of attributes is an important step in the development of a conjoint study. It includes understanding respondents' decision-making procedure among pertinent attributes that form the basis for selecting alternatives. The aim of this research is to identify salient attributes that influences consumer preferences for imported rice. There are several methods illustrated in the literature for selecting relevant attributes (see Louviere, 1998; Rao, 2014). For this study, focus group session was held, texture, taste, aroma, colour and grain size were identified by respondents as determinant factors. Respondents also report price to be important not only because imported rice is relatively more expensive than the local varieties but it also differentiate among various imported varieties. The inclusion of price also provides the opportunity to evaluate the willingness to pay for non-price attributes which is required in establishing economic feasibility alongside consumer preferences.

2.2 Determining Attribute Levels

This step is a bit critical; an essential consideration is to ensure that the individual combinations are practical from an R&D perspective (Rao, 2014). Relevant data on the most commonly consumed imported rice varieties were gathered during the group discussion session to inform the specification of attribute levels. The chosen attributes were applied to theses and appropriated levels were determined. Rice is a strategic food in Malaysia and assigning an exact value to price level might be biased especially where there are different brands of imported rice with varying arrays of prices in the market. Price was designated using no increase, 5% increase and 10% increase in current price respectively. The attributes and levels used in this research are displayed in Figure 1.

Texture	Taste	Aroma	Colour	Grain size	Price
• Sticky	• Plain tasting	• Non-Aromatic	• White	• Short	• No Increase
• Non-sticky	• Tasteful	• Aromatic	• Creamy white	• Medium	• 5% Increase
				• Long	• 10% Increase

Figure 1: Attributes and Levels of Imported rice Varieties

2.3 Scenario Construction and Presentation

Having ascertained the relevant attributes and their levels, constructed profiles comprising a range of attributes were developed and presented to the respondents for evaluation. During the profile construction process, approximately 144 possible profiles were generated ($2^4 \times 3^2$). This needs to be reduced to a realistic size, as it may be inappropriate to ask respondents to evaluate their preferences for too many scenarios. The number of profiles was restricted to twelve using the fractional factorial design in SPSS Conjoint with careful consideration given to excluding profiles that appear too good to be true, particularly those with desirable attributes offered at a low price.

There are several techniques that can be used to solicit preferential information from participant in conjoint research. These techniques are usually associated with the methods used for constructing the profiles. A full-profile conjoint method, in which respondents were required to rate their preferences for a product described by all attributes was used. This approach is illustrative, particularly in terms of survey administration, and is also more convenient for respondents as it facilitates comprehension of the product prior to evaluation (Rao, 2014). There are three basic methods of profile presentation; prototype (original sample of the actual product presented for the study), pictorial description and verbal description. This research employed a verbal representation, which respondents were asked to rate on a scale from one to ten, with one indicating 'least preferred' and ten indicating 'most preferred'.

2.4 Establishing Preferences and Estimating Utilities

After determining the attributes and their respective levels, and presenting the profiles to the respondents, preferences for the scenarios were obtained. Respondents rated the profiles according to their preferences for the various attribute combinations. The linear additive model was used to specify the relationship between attributes and utility, in order to determine the relative importance of each attribute. The model assumes an independent part-worth for each attribute level, and the total utility is the sum of the part-worths of the attribute levels. The term level part-worth describe the holistic value individuals assigned to each level of the attributes. The linear additive model is given as:

$$U = \beta_0 + \beta_1 \text{Texture} + \beta_2 \text{Taste} + \beta_3 \text{Aroma} + \beta_4 \text{Colour} + \beta_5 \text{Grain size} + \beta_6 \text{Price} \quad (1)$$

Where U is the utility or preference score for a rice variety with a given level of each attributes; Texture represents the texture of the cooked rice, with 1 indicating sticky and 2 indicating non-sticky; Taste is represented by two levels (plain and tasteful), with 1 indicating plain taste and 2 indicating tasteful; Aroma refers to the redolent smell from the rice especially during cooking, with 1 indicating non-aromatic and 2 indicating aromatic; The colour of the rice grain is represented by 1 (white) and 2 (creamy white); Grain size describes the length of

the grain as short, medium, or long, with 1 indicating short, 2 indicating medium, and 3 indicating long; and price indicates the three levels included in the study (no increase, a 5% increase, and a 10% increase in the current price, respectively). The parameters β_0 to β_6 represent the model coefficients to be estimated. Ordinary Least Square (OLS) regression was used to estimate the part-worths. This is possible because OLS regression analysis models independent product attributes. Subsequently, utility ranges are used to calculate importance scores for each attribute. Special attention was given to respondents' income variables as they were required to indicate their income among the ranges of income provided. Segmentation approach was used to separate respondents in to 3 groups based on their incomes (Group 1, <600 USD; Group 2, between 600 USD to 1200 USD; Group 3, >1200 USD). Data was analyzed for each individual after which each group was analyzed separately so as to compare differences in their preferences and to illustrate the association between price and other attributes between the three groups.

2.5 Willingness to Pay

Consumers' perception of quality has been found to influence their willingness to pay as consumers tend to relate higher quality with greater value and satisfaction (Kushwah et al., 2019; Ferreira et al., 2024). Nonetheless, consumers are still likely to choose profiles with higher quality and lower price levels (Hanis et al., 2012). That is, while consumers may value quality, they are inherently price-sensitive and tend to seek options that offer greater utility. This behavior reflects the fundamental principle of rational choice, whereby consumers aim to maximize utility at the lowest possible cost. However, from an economic perspective, the demanded quality must be attainable, necessitating a trade-off between quality and price. Thus, willingness to pay is evaluated to estimate the maximum amount of money an individual is prepared to sacrifice to attain a specified level of satisfaction (Galawat and Yabe, 2010).

The introduction of price as a factor in a conjoint analysis enables the estimation of consumers' willingness to pay for the other attributes evaluated in the research. It reflects the amount individuals are willing to pay for each incremental improvement in an attribute. It is derived by taking the ratio of the coefficient of each non-price attribute to that of the price attribute. In this research, willingness to pay was evaluated for five attributes- texture, taste, aroma, colour, and grain size

3. Results and Discussions

3.1 Factors Influencing Rice Consumption

Table 1 shows the result of the factors influencing rice consumption. Consumers response clearly support the attributes included for the CA questionnaire. Price and colour are the most selected and least selected attributes respectively.

Table 1. Factors Influencing Rice Consumption

Attributes	Frequency	Percent
Texture	480	96
Taste	487	97.3
Aroma	471	94.2
Colour	454	90.7
Grain	471	94.2
Price	487	97.3

3.2 Relationship Between Price and Other Non-Price Attributes Among the Groups

Table 2 shows that price is the most important factor across all the three income groups with a negative coefficient which suggest that the higher the price of rice the lower the preference score. This is logical due to the presence of multitude varieties with varying prices in the market to choose from. Similar results has also be found in other food products using the same technique (Mesías, 2011). However, the relative importance of price in relation to other non-price attributes varies across the group. Among the groups, group 2 attached the highest importance to price (38.02%) compared to other attributes which is due to their higher marginal valuation of cost compared to other groups. Group 1 assigned the least importance to price among the three groups, with a score of 28.58%. While this may seem unexpected, it could be attributed to the fact that low-income earners spend a larger percentage of their income on food, particularly rice, which is consumed at least twice daily by a significant portion of the population. Additionally, this trend may reflect an overestimation of their budget constraints when making purchasing decisions. The higher marginal valuations of price in Group 2 (38.02) and Group 3 (33.02) indicate that middle-income and affluent individuals tend to prioritize better-quality rice, resulting in a greater focus on price.

Table 2. Price and Non-Price Attributes

Groups	Most important Attribute	2 nd most important Attribute	Part-worth (price)	Relative importance (%)	Part-worth (other attributes)	Relative importance (%)
Group 1 (< 600)	Price	Texture	-1.263	28.58	3.156	71.42
Group 2 (600-1200)	Price	Grain size	-1.792	38.02	2.922	61.98
Group 3 (> 1200)	Price	Grain size	-2.039	33.02	4.135	66.98

3.3 Part-Worths and Relative Importance of Non-Price Attributes

Table 3 reveals the part-worths utility scores for each level of attribute and the relative importance of each attribute. The sign of the part-worth scores reveals whether a particular attribute has positive or negative effect on consumer preference. When a part-worth score is positive, it signifies that the attribute increases overall preference; conversely, a negative score implies a diminishing effect. For Group 1, texture is the most important attribute, with non-stickiness providing the highest utility. This is followed by taste, grain size, and aroma, where consumers favour rice that is tasteful, long-grained, and aromatic. Colour ranks as the least important attribute, with white rice yielding higher utility than creamy white rice. For Group 2, grain size (medium grain) is the most important attribute, followed by non-stickiness in texture, aromatic scent, and taste (tasteful), with colour (white) being the least important factor. In Group 3, grain size is also the most important attribute, but unlike Group 2, long grain provides higher utility than medium grain. Following grain size are non-stickiness in texture, taste, and aroma, with colour (white) being the least important attribute. The result reveals the differences between the groups as regards their preferences for rice attributes. Texture is the most important attribute for Group 1, unlike Groups 2 and 3, where grain size gives the highest utility. Group 1 places less emphasis on aroma compared to Groups 2 and 3, deriving greater utility from taste. Group 2 values aroma more than taste, while Group 3 prioritizes taste over aroma. However, in both Groups 2 and 3, grain size and texture are the top two attributes, respectively. Colour is the least important attribute to all groups with white rice preferred over creamy white rice across the three groups. The part-worth scores for price are negative across all groups, indicating an inverse relationship between price and other attributes, where higher prices lead to a reduction in overall utility. This result is consistent with similar studies in food

products using the same technique (Hanis et al., 2012; Mesías et al., 2011). Figures 2 - 4 present the relative importance of each attribute for the three income groups.

Table 3. Part-Worths and Relative Importance

Attributes	Level	Group1 Part-worths	Relative importance (%)	Group2 Part-worths	Relative importance (%)	Group3 Part-worths	Relative importance (%)
Texture	Sticky	-1.072	33.97	-0.876	29.98	-1.273	30.79
	Non-sticky	1.072		0.876		1.273	
Taste	Plain taste	-0.693	21.96	-0.413	14.13	-0.643	15.55
	Tasteful	0.693		0.413		0.643	
Aroma	Non aromatic	-0.440	13.94	-0.442	15.13	-0.628	15.19
	Aromatic	0.440		0.442		0.628	
Colour	White	0.311	9.86	0.068	2.33	0.240	5.79
	Creamy	-0.311		-0.068		-0.240	
	white						
Grain size	Short	-0.640	20.28	-1.123	38.43	-1.351	32.68
	Medium	0.303		0.566		0.603	
	Long	0.337		0.557		0.748	
Price	Actual price	-0.086	-	-0.126	-	-0.125	-

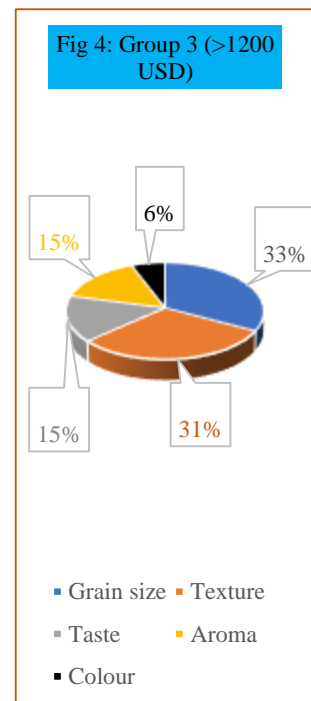
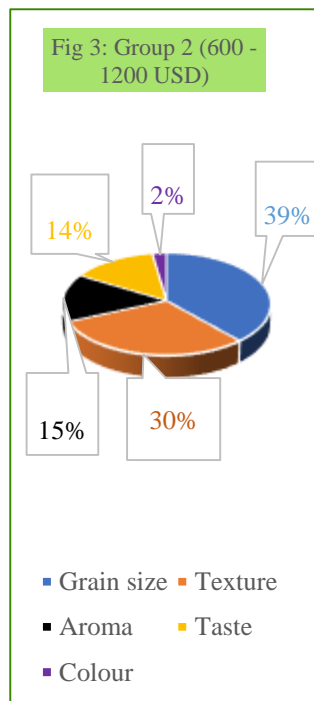
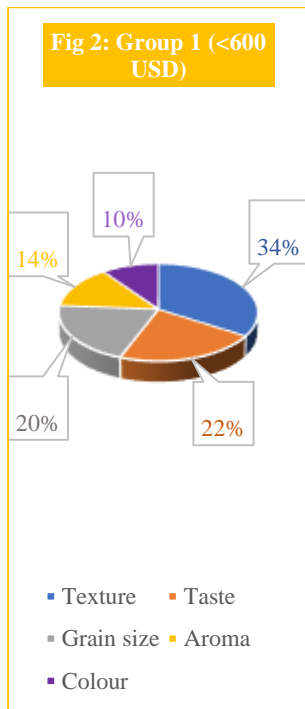


Figure 2-4: Relative Importance of Rice Attributes Across Income Groups

3.4 Willingness to Pay

The preceding results show that the product has to be cheap across all groups. However, products need to be financially feasible, and it will be impossible to offer premium rice at an unrealistic price. Table 4 reveals the result of the willingness to pay. Willingness to pay was estimated using the current average price of imported rice; 0.83 USD per kg. The finding suggests that group 1 has the highest overall willingness to pay, they are willing to offer 0.42 USD per kg for a unit improvement in the total quality of rice, 0.71 USD per kg for a unit improvement in texture, 0.46 USD per kg for a unit rise in taste, 0.29 per kg for a unit improvement in aroma, 0.42 USD per kg per unit improvement in grain size and 0.20 USD per kg for unit decrease in colour (white rice instead of creamy white rice). Group 2 has the least WTP across the group with an overall WTP of 0.20 USD per kg for per unit improvement in the overall quality of rice, 0.41 USD per kg for a unit improvement in texture, 0.19 USD per kg for a unit increase in taste, 0.20 USD per kg for a unit rise in aroma, 0.52 USD per kg for a unit improvement in grain size and 0.03 (not significant) per kg for a unit decrease in colour (white rice instead of creamy white rice). Group 3 has an overall WTP of 0.34 USD/kg per unit improvement in the total quality of rice, 0.52 USD per kg for a unit improvement in texture, 0.26 USD per kg for a unit improvement in taste, 0.27 USD per kg for a unit improvement in aroma, 0.55 USD per kg for a unit improvement in grain size and 0.09 USD per kg for a unit decrease in colour (white rice preferred to creamy white rice)

Essentially, Group 1 demonstrates the highest WTP, which is intriguing given their income level. Their willingness to pay more for specific attributes indicates a strong desire for better quality rice, despite possible budget limitations. Group 2 exhibits the lowest overall WTP, indicating a more cautious approach to spending. This suggests that middle-income consumers are more price-sensitive, although they still value attributes like texture and grain size. Group 3 shows a moderate WTP for quality attributes, aligning with the expectation that affluent consumers are more willing to consume rice with superior attributes. Overall, these results highlight the varying importance of rice attributes across income groups. Therefore, marketing strategies for rice can be tailored to these distinct preferences, ensuring that quality attributes are effectively communicated to resonate with each consumer group.

Table 4. Willingness to Pay for Non-Price Attributes (USD)

ATTRIBUTES	GROUP 1	GROUP 2	GROUP 3
Texture	0.71	0.41	0.52
Taste	0.46	0.19	0.26
Aroma	0.29	0.20	0.24
Colour	0.20	0.03	0.09
Grain size	0.42	0.52	0.55
Overall WTP	0.42	0.20	0.34

4. Conclusions

This study adopts a consumer-oriented approach, creating a platform for satisfying consumer tastes and addressing market demand. This is essential as the government continues to enhance local rice varieties to reduce importation. In this context, conjoint analysis was employed to identify the most important attributes influencing consumer preferences for imported rice across different income groups. Price emerged as the most important attribute among all three income groups. This result aligns with previous studies that identified price as a key determinant of household consumer preferences for rice (Obih et al., 2017; Sulumbe et al., 2023). Accordingly, group 1 placed the least importance on price (28.58%) compared to group 2 ((38.02%) and group 3 (33.02%), reflecting a desire for better food experiences despite

budget constraints. This suggests that, regardless of income, consumers prioritize price when selecting rice. This is consistent with Amfo et al., (2023) who noted that price constitutes a significant determinant of rice consumption in urban Ghana. Thus, farmers and marketers should consider competitive pricing strategies while also focusing on enhancing quality attributes to appeal to various consumer segments.

For Group 1, the non-price attributes were prioritized as follows: texture (33.97%), taste (21.96%), grain size (20.28%), aroma (13.94%), and colour (9.86%). In Group 2, the non-price attributes were ranked as: grain size (38.43%), texture (29.98%), aroma (15.13%), taste (14.13%), and colour (2.33%). For Group 3, the non-price attributes were: grain size (32.68%), texture (30.79%), taste (15.55%), aroma (15.19%), and colour (5.79%). These findings revealed that group 1 places the highest value on texture, indicating a strong desire for quality that enhances their dining experience. In contrast, Group 2 emphasizes grain size, suggesting that visual appeal and perceived quality are important in their purchasing decisions. Group 3 shows a somewhat balanced interest in both grain size and texture, reflecting their expectation for premium quality rice. Therefore, efforts aimed at developing local rice varieties with quality attributes, particularly texture and grain size, similar to those of imported varieties will not only meet market demands but also reduce reliance on imports and enhance farmers' profits. The importance of intrinsic attributes such as texture, taste, aroma, and grain size has been highlighted in previous studies. Sulumbe et al. (2023) reported that consumers prefer rice that is cleaner, long-grained, and non-sticky. Similarly, the role of intrinsic characteristics in shaping consumer preferences has also been emphasized by Alhassan et al. (2015), Mottaleb and Mishra (2016), and Ehiakpor et al. (2017).

Another important aspect of conjoint analysis is its ability to quantify the economic value consumers assign to various attributes included in the study. By incorporating price as an attribute, it becomes possible to assess consumers' willingness to pay for these specific features. Group 1 demonstrates the highest overall willingness to pay, at 0.42 USD per kg, for each unit increase in quality. In contrast, Group 2 exhibits the lowest willingness to pay, at 0.20 USD per kg, while Group 3 is willing to pay 0.34 USD per kg for a unit increase in quality. Specifically, Group 1's willingness to pay (WTP) per kg for a unit increase in quality based on each attribute are texture (0.71 USD), taste (0.46 USD), grain size (0.42 USD), aroma (0.29 USD), and colour (0.20 USD). For Group 2, the WTP per kg based on each attribute is grain size (0.52 USD), texture (0.41 USD), aroma (0.20 USD), taste (0.19 USD), and colour (0.03 USD). In Group 3, the WTP per kg for a unit increase in quality includes grain size (0.55 USD), texture (0.52 USD), taste (0.26 USD), aroma (0.24 USD), and colour (0.09 USD). The results suggest a potential internal substitution as rising incomes and increasing demand for higher-quality rice drive consumer preferences. This finding is in-line with Amfo et al., (2023) who emphasized that as household income rises and affordability increases, consumers tend to shift toward imported rice, perceiving it to possess superior quality attributes. While consumers remain price-sensitive, they still prioritize quality and are willing to pay more for superior rice varieties. The distinct preferences identified across consumer groups can be leveraged as a marketing strategy to enhance consumers' satisfaction. Furthermore, the government should intensify efforts towards introducing local rice varieties with superior attributes similar to premium imported ones. This would boost farmers' incomes, reduce import costs, and offer consumers more reasonably priced, high-quality rice.

References

Abdullahi Farah, A., Zainalabidin, M., & Ismail, A. L. (2011). The influence of socio-demographic factors and product attributes on attitudes toward purchasing special rice among Malaysian consumers. *International Food Research Journal*, 18(3).

- Abubakar, Y. I., Rezai, G., Shamsundin, M. N., & Muhamed, Z. (2015). Malaysian consumers' demand for quality attributes of imported rice. *Australian Journal of Basic and Applied Sciences*, 9(37), 317-322.
- Adegbola, Y. P., Ahoyo Adjovi, N. R., Adekambi, S. A., Zossou, R., Sonehekpon, E. S., Assogba Komlan, F., & Djossa, E. (2019). Consumer preferences for fresh tomatoes in Benin using a conjoint analysis. *Journal of International Food & Agribusiness Marketing*, 31(1), 1-21
- Alhassan, H., Frimpong, T., & Mohammed, A. S. (2015). Do Ghanaian rural consumers prefer imported rice to local rice? Evidence from Akuapem North Municipality. *Applied Research Journal*, 1(3), 24-34.
- Amfo, B., Abankwah, V., & Bahahudeen Shafiwu, A. (2023). Local rice consumption and attributes considered in urban Ghana: Does internal migration matter?. *Cogent Food & Agriculture*, 9(2), 2281098.
- Hanis, A.I.A.H., Jinap, S., Nasir, S.M., Alias, R. and Karim, M.S. (2012), "Consumers' demand and willingness to pay for rice attributes in Malaysia", *International Food Research Journal*, Vol. 19 No. 1: pp. 363-369.
- Hanis, A.I.A.H., Jinap, S., Mad Nasir, S., & Alias, R. (2013). Consumer preference for food attributes in malaysia: case studies on broiler and beef. *Journal of international food and agribusiness marketing* 25: 137-153.
- Arboretti, R., & Bordignon, P. (2016). Consumer preferences in food packaging: CUB models and conjoint analysis. *British Food Journal*, 118(3), 527-540.
- Bernas, Padiberas Nasional Berhad (2023). Retrieved from <https://www.bernas.com.my/commitment/downstream/rice-distribution-marketing>.
- De Pelsmaecker, S., Schouteten, J. J., Lagast, S., Dewettinck, K., & Gellynck, X. (2017). Is taste the key driver for consumer preference? A conjoint analysis study. *Food Quality and Preference*, 62, 323-331.
- Dorairaj, D., & Govender, N. T. (2023). Rice and paddy industry in Malaysia: governance and policies, research trends, technology adoption and resilience. *Frontiers in Sustainable Food Systems*, 7, 1093605.
- Ehiakpor, D. S., Apumbora, J., Danso-Abbeam, G., & Adzawla, W. (2017). Households' preference for local rice in the Upper East Region, Ghana. *Advances in Agriculture*, 1(1), 1-9. <https://doi.org/10.1155/2017/1812975>
- Engku Ariff, E. E., Rahim, H., Harun, R., & Ahmad Sobri, A. (2019). Fragrant rice overview: Benefits and implications of local production. *Economic and Technology Management Review*, 14.
- Ferreira, L. S. D. O., Silveira, R. L. F. D., & Maia, A. G. (2024). Willingness to Pay and Framing Effect: Evidence from Organic Tomatoes. *International Journal of Food and Agricultural Economics (IJFAEC)*, 12(2).
- Fitzgerald, M. A. (2010). Rice: characteristics and quality requirements. In *Cereal Grains* (pp. 212-236). Woodhead Publishing.
- Galawat, F., & Yabe, M. (2010). Assessing Consumer's Preference for Local Rice in Brunei: An Application of Choice Model. *J. ISSAAS*, 16(2), 104-115.
- Gosine, L., & McSweeney, M. B. (2019). Consumers' attitudes towards alternative grains: A conjoint analysis study. *International Journal of Food Science & Technology*, 54(5), 1588-1596.
- Green, P. E., & Rao, V. R. (1971). Conjoint measurement for quantifying judgmental data. *Journal of Marketing Research*, 8, 355-363.
- Jamal, K., Kamarulzaman, N. H., Abdullah, a. M., Ismail, M. M., & Hashim, M. (2013). Farmer's acceptance towards fragrant rice farming: The case of non-granary areas in the East Coast, Malaysia. *International Food Research Journal*, 20(5), 2895-2899.

- Kushwah, S., Dhir, A., Sagar, M., & Gupta, B. (2019). Determinants of organic food consumption. A systematic literature review on motives and barriers. *Appetite*, 143, 104402
- Louviere, J. J. 1988. *Analyzing decision making: Metric conjoint analysis*. Newbury Park: Sage Publications Inc.
- Mesías, F. J., Martínez-Carrasco, F., Martínez, J. M., & Gaspar, P. (2011). Functional and organic eggs as an alternative to conventional production: A conjoint analysis of consumers' preferences. *Journal of the Science of Food and Agriculture*, 91(3), 532–538.
- Mottaleb, K. A., & Mishra, A. K. (2016). Rice consumption and grain type preference by household: A Bangladesh case. *Journal of Agricultural and Applied Economics*, 48(3), 298–319. <https://doi.org/10.1017/aae.2016.18>
- Obih, U., & Baiyegunhi, L. S. (2017). Willingness to pay and preference for imported rice brands in Nigeria: Do price–quality differentials explain consumers' inertia?. *South African Journal of Economic and Management Sciences*, 20(1), 1-11.
- Oenning, E. J., Guimarães Junior, D., & Medeiros, D. D. D. (2018). Brazilian consumer preferences for processed tomato packaging using conjoint analysis. *Journal of Food Products Marketing*, 24(6), 724-744.
- Rahim, F. H. A., Hawari, N. N., & Abidin, N. Z. (2017). Supply and demand of rice in Malaysia: A system dynamics approach. *Int. J Sup. Chain. Mgt*, 6, 1-7.
- Rajamoorthy, Y., & Munusamy, S. (2015). Rice industry in Malaysia: Challenges, policies and implications. *Procedia Economics and Finance*, 31, 861-867.
- Rao, V. R. (2014). *Applied conjoint analysis*. New York: Springer.
- Sampalean, N. I., De-Magistris, T., & Rama, D. (2020). Investigating Italian consumer preferences for different characteristics of provolone valpadana using the conjoint analysis approach. *Foods*, 9(12), 1730.
- Samat, N. H., Saili, A. R., Yusop, Z., Fatah, F. A., & Aziz, A. S. A. (2022). Factors Affecting Selection of Rice among the Consumer in Shah Alam, Selangor. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1059, No. 1, p. 012005). IOP Publishing. DOI 10.1088/1755-1315/1059/1/012005
- Sulumbe, I. M., Idi, A. S., & Ngubdo, Y. M. (2023). Determinants of Consumer Preference for Rice in Maiduguri Metropolitan Council of Borno State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences*, 9(2), 68-75.
- Van der Pol, M. and Ryan, M. (1996), "Using conjoint analysis to establish consumer preferences for fruit and vegetables", *British Food Journal*, Vol. 98 No. 8, pp. 5-12.
- Walisinghe, B. and Gunaratne, L. (2012). Consumer Preferences for Quality Attributes of Rice: A Conjoint Analysis. *Sri Lankan Journal of Agricultural Economics*, 10, pp.19–30. DOI: <http://doi.org/10.4038/sjae.v10i0.4589>.
- Wang, F., Wang, H., & Cho, J. H. (2022). Consumer preference for yogurt packaging design using conjoint analysis. *Sustainability*, 14(6), 3463.