Consumers' preference and market segmentation in developing countries: Rice marketing in Tanzania

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ABSTRACT

The study analysed quality attributes that determine consumers' preference and demand for food by taking the case of rice consumption. This study also explored the segmentation of the rice market in Tanzania based on the rice products' attributes. Surveys and conjoint ranking exercises were conducted with 300 rice consumers randomly selected in Dar es Salaam and Morogoro markets in Tanzania. The conjoint analysis intended to assess the importance of preference attributes for rice products and simulate the preference market share. Subsequently, a cluster analysis identified consumer segments in the market, and a multinomial logit model was used to analyse the influence of socioeconomic characteristics on the probability of fitting into a particular segment. The results revealed that aroma, non-broken rice grains, and cleanness are key preference attributes. Three consumer segments were identified: consumers who received quality cues from the origin and were also price-driven, consumers who pursued aroma as the prime quality attribute, and consumers who explored all quality aspects. The illustrative segments indicate the possibility of identifying market niches and, consequently, orient rice production, processing and marketing, to target the preferences and needs of such niches. Producers must invest in the production of aromatic varieties because aroma remains the key attribute preferred in Tanzania. Traders and processors must invest in advanced technology to improve the cleanness of rice and reduce the proportion of broken rice. The government and development partners must support research to promote the attributes desired in rice markets.

Keywords: Rice quality attributes, Conjoint analysis, Rank-ordered logistic regression, Discrete choice model, Cluster analysis, Consumer segments

INTRODUCTION

The theory of consumer behaviour stipulates that consumers seek to identify and select the consumption bundle they most prefer based on tastes and expectations (Bray, 2008). Preference is determined by utility (The Luc & Soubeyran, 2013). In other words, from the theoretical perspective of Lancaster (1966), consumers derive utility from a bundle of attributes and frequently pay a premium price for desired attributes. These desired attributes are often identified in terms of quality criteria. Quality is inferred from various cues and characteristics, namely, intrinsic and extrinsic quality characteristics (Banovic, Grunert, Barreira & Fontes, 2009). Intrinsic attributes are physical and chemical properties built into the product and indicative of objective quality (Grunert, 2005). According to Jimenez-Guerrero, Gázquez-Abad, Huertas-García & Mondéjar-Jiménez (2012), intrinsic attributes cannot be changed without altering the nature of the product. Extrinsic characteristics are product-related attributes but not part of the physical product, they exist outside the product (e.g. brand, price, country of origin, services) (Luning & Marcelis, 2009). Several authors have agreed that extrinsic attributes are not essential or inherent in the product; however, they can

affect the users' quality perception or product's acceptance (Espejel, Fandos & Flavián, 2007; Li, Shoemaker, Maa, Moon & Zhong, 2008; Banovic et al., 2009; Napsintuwong, 2012; Fiamohe, Nakelse, Diagne & Seck, 2015). Grunert (2005) describes such extrinsic attributes as subjective quality, whereas intrinsic attributes are referred to as objective quality.

Although the aforementioned attributes convey the quality expectations consumers use to evaluate products, the quality assessment is completed through the experience of cooking and eating. According to Brunsø, Fjord & Grunert (2002) and Campo, Furnols, Nute, Oliver, San-Julián & Sañudo (2006), the relationship between quality expectation and quality experience (i.e. before and after the purchase) determines product satisfaction and consequently, the probability of repurchasing the product. Notably, apart from the attributes of the product, actual consumption behaviour depends on 'practical, institutional or economic realities of the world' (Jehle & Reny, 2000). Hence, in line with consumer demand analysis, factors such as income and price are critical in the determination of choices that are conceivable and realistically attainable by consumers.

Within this choice net, consumers can reveal their preference-led decisions. The current decade's increased focus on food quality in developing countries highlights the transformation in food markets where consumers' food choices are oriented towards quality-differentiated marketing systems associated with an increase in demand for quality products, especially as a result of increasing income and urbanisation (Reardon & Timmer, 2005). However, increasing dissatisfaction has been observed with product quality among consumers due to failure of the existing market systems to communicate quality (see, e.g. Mujawamariya, Burger & D'Haese, 2012).

The basis for differentiation is that consumers are, in general, heterogeneous in behaviour (East, Singh, Wright & Vanhuele, 2016); in a particular market, they rarely have exactly the same needs and expectations. Differentiation can therefore respond to distinct consumer segments. Consumers who share the same preferences, based on their needs, socioeconomic criteria, lifestyles, values, geographic, psychographic, and behavioural features represent a specific consumer segment (Pouta, Heikkilä, Forsman-Hugg, Isoniemi & Mäkelä, 2010; Wedel & Kamakura, 2002; Kotler & Armstrong, 2012). According to Kotler & Armstrong (2012), in the market, segmentation helps firms define particular marketing mix strategies that target customers belonging to each segment with specific profiles and needs. Thus, differentiation creates opportunities for producers and value chain actors to produce and supply products by aiming to serve specific target markets (Grunert, 2005).

Studies of consumer preferences for rice (e.g., Kaosa-ard & Juliano, 1992; Ara, 2003; Suwannaporn & Linnemann, 2008; Azabagaoglu & Gaytancioglu, 2009; Anang, Adjetey & Abiriwe, 2011; Walisinghe & Gunaratne, 2012) have demonstrated the importance of quality attributes. Attributes intrinsic to rice include cleanness, homogeneity, sensory attributes (e.g. flavour, aroma, taste, texture, proportion of damaged, and discoloured grains), and extrinsic attributes of rice include presentation, packaging, brand, and the label (also see Demont, Rutsaert, Ndour & Verbeke, 2013b). These factors and other identified criteria such as price, location (area of rice production or sale) affect the consumers' choices (Walisinghe & Gunaratne 2012).

In considering specific markets, differences in preference attributes are observed. For instance, Goodwin, Holcomb & Rister (1996) indicated that the demand for rice by Asian-Americans in Houston, Texas, was primarily influenced by the size of grain and packaging, whereas taste, cooking quality, cooking time, and aroma defined the quality of rice most preferred by consumers in Ghana (Anang et al., 2011). In several cases, consumers have used the country of origin as a quality indicator (Schnettler, Ruiz, Sepúlveda, Sepúlveda & Denegri, 2009; Allaire, Casabianca & Thévenod-Mottet, 2011; Pouta et al., 2010). This criterion is observed, for instance, in the Thailand export market for jasmine rice (Suwannaporn & Linnemann, 2008) and in the Chilean market (Schnettler et al., 2009).

Health concerns are also at the heart of preference attributes for rice. For instance, consumers in the Japanese rice market readily paid a premium for domestic certified rice and pesticide- and fertiliser-free rice (Hara, 2000). In the Philippines, health and certification were the primary factors in consumption of organic rice (Ara, 2003).

In Tanzania, distinct rice consumer groups are identified. These groups are (1) rural consumers who also produce rice, (2) middle- and high-income urban consumers, and (3) institutions such as schools and hospitals (Wilson & Lewis, 2015; Kilimo Trust, 2017). In the country, evidence has indicated an increase in rice consumption levels

due to increasing incomes; therefore, efforts are being made to increase rice availability by providing improved rice varieties and sensitising farmers to adopting good agronomic practices (KATRIN, 2012). Interest in increasing the understanding about the needs and preferences of the growing group of urban consumers' and the related influencing factors is necessary, however, because the current market system does not permit a clear differentiation of quality attributes.

No formal grading system exists in local markets (MAFSC, 2009; Wilson & Lewis, 2015). For instance, rice originating from different production regions is often sold under a single origin associated with the best quality rice (Allaire et al., 2011). In popular markets for foodstuffs in Tanzania, rice is not packaged but weighed in kilograms as requested by the buyer; consumers are indifferent as to how much they value branded packaging (Kilimo Trust, 2014).

Indicators of rice grades are not clearly defined at local markets either (Wilson & Lewis, 2015). Premium rice that is aromatic and less than 5% broken is available in supermarkets. In markets, rice is sold in packages of different weights, such as 1, 2, or 5 kg. Challenges remain in obtaining a complete idea of what consumers prefer. The popular definition of quality has aromatic and breakage attributes, but the influence of other factors, such as cleanness, 'true' origin, and price as well as the relationship among these factors on consumers' behaviour is unclear.

Against this backdrop, this study investigated consumers' preference for rice. Specifically, this study sought to (a) determine the attributes that explain consumers' preference for rice in general, (b) identify the main segments in the popular urban market for rice, and (c) analyse the socioeconomic factors that distinguish these segments. Although the study covers the rice sector in Tanzania, the qualitative lessons enrich the discussion on food marketing, especially in developing countries where market information is often absent. This study is valuable because when income levels increase and the market for rice expands, consumers will pay premium prices for specific rice attributes. Additionally, understanding consumer preference is critical for product development, design, and acceptance and consumer segmentation (Blijlevens, Creuexsen & Schoormans, 2009).

Section 2 includes details on the methodological steps and a description of the data. Section 3 presents the results, and section 4 discusses these results. Section 5 concludes by providing a summary of the main findings, further research indications, and policy implications.

METHODOLOGY

This study applied a variety of approaches. In the first stage, conjoint analysis was used to determine attributes that explain consumers' preferences and how these preferences translate into market preference shares. Subsequently, a cluster analysis was conducted to identify consumer segments. Lastly, the socioeconomic characteristics that influence segmentation were investigated through a discrete choice model.

Conjoint analysis of consumer preferences

The conjoint analysis belongs to the family of stated preference methods that have been used in consumer research. These methods apply survey and hypothetical design approaches or choice trials, where a person is directly or indirectly asked to express their value for a good or service. The purpose is to generate information on the valuation of attributes among commodities (Breidert, 2005; Lusk & Shrogen, 2007).

This study followed three main interrelated steps in the conjoint analysis procedures. The first step was an identification of appropriate attributes and levels as stimuli for consumer choice. The second step was a selection of an experimental design and the formulation of a survey instrument for collecting conjoint data. The third step entailed choosing an appropriate composition model and estimating buyer part-worth utilities (Breidert, 2005; Houser, 2006). The 'part-worth' for each of the notable product attributes is a disaggregation of the overall preference or total 'worth' of a product representing the individual consumer's utility (Hair, Black, Babin & Anderson, 2010).

The rice attribute levels were identified from the literature, including the work of Goodwin et al. (1996), Anang et al.

(2011), Walisinghe & Gunaratne (2012), Demont, et al. (2013b) and Fiamohe, et al. (2015), as critical determinants of quality in the market and for consumer preferences. These major rice attributes include grain colour, length and shape, aroma, swelling capacity, taste, cleanness, breakage rate/cracks, origin, and price (e.g., Ara, 2003; Suwannaporn & Linnemann, 2008; Azabagaoglu & Gaytancioglu, 2009; Anang et al., 2011; Walisinghe & Gunaratne, 2012). The selected attributes were origin, aroma, cleanness, and breakage rate/cracks.

The choice of attributes is influenced by the following: (1) the rice grain appearance is almost uniform in Tanzania, and the varieties traded in the market are white and have long grains; and (2) no reliable information on quality characterisation of rice types in terms of translucence, chalkiness, or taste is available to be easily translated into the factors determining consumers' choice (MAFSC, 2009; Wenela, 2013; Wilson & Lewis, 2015). Price is added to these attributes, although it is correlated with the other attributes (i.e. origin, aroma, cleanness, and breakage rate), because price is an attribute that represents a special value component for many products and services (Hair et al., 2010); as aforementioned, it determines realistic and attainable choices. The included attributes were confirmed through market observations and formal interactions with market actors. The related levels and characteristics are shown in Table 1.

Origin indicates the rice production region. Origin is one of the most applied extrinsic cues of food quality, and this implies that the product has specific qualities due to the production location (Allaire et al., 2011). As Grunert (2005) explained, consumers may use this cue to link the product to knowledge of the region of origin, which may be relevant in forming a quality evaluation. Consumers may use this cue at the time of repeat purchases to re-identify the product. This process is especially relevant when the product does not carry a strong brand and implies that consumers have knowledge about the region of origin (otherwise, this information would not hold any meaning to them) or that information on the exact origin is available.

The three regions investigated in this study were Mbeya, Morogoro, and Shinyanga and, according to the Ministry of Agriculture, Food Security and Cooperatives (MAFSC) (2009), these are some of the main rice-growing areas in Tanzania. Other regions where rice is grown include Arusha, Rukwa, Tabora, and Ruvuma. All together, these regions account for 78% of the rice produced in Tanzania (Mwakalinga & Massawe, 2007). Rice from Pakistan, Vietnam, and India represent the major share of imported rice found in supermarkets. Most rice consumers in Tanzania prefer locally produced rice to imported rice; they associate the imported rice with a lack of freshness, aroma, and taste (Wilson & Lewis, 2015).

TABLE 1:
RICE ATTRIBUTES AND LEVELS FOR CONJOINT ANALYSIS

Attributes	Level of attributes
Origin	Rice from Morogoro
	Rice from Mbeya
	Rice from Shinyanga
Cleanness	Clean rice
	Non-clean rice
Breakage rate[a]	Broken rice
	Non-broken rice
Aroma	Aromatic rice
	Non-aromatic rice
Price per kg[b]	TShs [1,000-1,500]
	TShs [1,500-2,000]
	TShs [2,000-2,500]

[a]Broken rice contains greater than 30% breakage.
[b]The upper limit of price intervals is excluded.

Cleanness and breakage rate are retained as visual indicators of post-harvest quality. Although rice is a highly desirable food in urban areas, consumers do not appreciate spending time and energy to clean it prior to cooking (Stryker, 2010). Notably, local rice generally tends to have a greater amount of impurities unless precautions are taken at the intermediary levels of the value chain (millers and retailers) to sort and clean the rice before selling (Stryker, 2010). In such a case, a premium that partly covers the cost of sorting and cleaning is charged to the consumer. Regarding the breakage rate, consumers prefer not more than 20%–30% broken rice (Bill & Melinda Gates, 2012). The several extant small- and medium-sized millers do not use the modern equipment that prevents high breakage rates; thus, grading becomes costly to them (Bill & Melinda Gates, 2012). The breakage rate is also linked to some rice varieties and agronomic practices.

Aromatic rice is highly valued by consumers (Kilimo Trust, 2014; Wilson & Lewis, 2015). Local rice varieties are mainly aromatic. However, the low yields of such varieties and high demand for aromatic rice make this product generally more expensive than non-aromatic or semi-aromatic rice (Match Maker Associates Ltd, 2010), which is mixed with rice with aroma because there is little market for it otherwise (Wilson &Lewis, 2015). This study includes two levels of aroma: aromatic or not.

Three price intervals are included in the study. The use of intervals reflects that the price of rice is not fixed in markets: it varies overtime and across markets. A small range of 500Tsh (≈0.30USD at the exchange rate of 01 May 2014) is used for the intervals to ensure that consumers' behaviour is more or less the same at the low, medium, and high levels of price interval.

The design of the combinations of the factor levels permits ranking by consumers. These factor levels represent the product profiles. In this case, a full factorial design would have generated 72 hypothetical product profiles (three levels of origin, two levels of cleanness, two levels of breakage, two levels of aroma, three levels of price). This design is unmanageable because too many combinations exist for an individual consumer to rank them. To remedy this situation, the representative subsets of profiles were generated through an orthogonal array design. Using a statistical programme (SPSS 16), this orthogonal design generated 16 product profiles, which were presented to respondents for ranking from 1 to 16 based on their preference order (Table 2).

During the analysis, the ranking score for each combination was used to infer the relative contribution of the attribute levels (part-worth utility) and evaluate full product utility. The conjoint model assumed that (1) a product is a bundle of attributes (additively), (2) the utility of the product is a simple function of the utilities of the attributes, and (3) utility predicts behaviour (i.e. purchases) (Breidert, 2005; Gupta, Hansen & Singh, 2005). The utility from respondents' ranking of rice product profiles was calculated as the sum of the part-worth utilities of the levels of all rice attributes. Two estimation procedures were used in the analysis: a linear conjoint and a rank-ordered logit model.

The linear conjoint analysis model measures an individual's preference structure through systematic variation of the product attributes. It is represented by the following equation:

$$R_p = \beta_0 + \sum \beta_i^k D_{ij}^k + \varepsilon_i \quad (1)$$

where R_p is the ranking from 1 to 16 assigned to product p. D_{ij}^k is a dummy variable defined as:

$D_{ij}^k = \begin{cases} 1 \; if \; product \; i \; has \; level \; j \; on \; attribute \; k \\ 0 \; otherwise \end{cases}$.

β_i^k is the coefficient characteristic of each attribute, that is, the mean in ranking produced when the default level for

TABLE 2:
ORTHOGONAL DESIGN FOR RICE PROFILES

Card ID	Origin	Cleanness	Breakage	Aroma	Price interval
1	Shinyanga	Non-clean	Non-broken	Aromatic	TShs [2,000-2,500]
2	Morogoro	Clean	Non-broken	Non-aromatic	TShs [1,000-1,500]
3	Shinyanga	Clean	Broken	Non-aromatic	TShs [1,000-1,500]
4	Shinyanga	Clean	Non-broken	Aromatic	TShs [1,500-2,000]
5	Morogoro	Non-clean	Broken	Aromatic	TShs [1,500-2,000]
6	Morogoro	Non-clean	Non-breakage	Non-aromatic	TShs [1,500-2,000]
7	Shinyanga	Non-clean	Breakage	Non-aromatic	TShs [1,000-1,500]
8	Morogoro	Clean	Non-breakage	Non-aromatic	TShs [2,000-2,500]
9	Mbeya	Non-clean	Non-breakage	Aromatic	TShs [1,000-1,500]
10	Morogoro	Non-clean	Non-breakage	Non-aromatic	TShs [1,000-1,500]
11	Mbeya	Clean	Breakage	Non-aromatic	TShs [1,500-2,000]
12	Morogoro	Clean	Breakage	Aromatic	TShs [1,000-1,500]
13	Morogoro	Clean	Breakage	Aromatic	TShs [2,000-2,500]
14	Morogoro	Non-clean	Breakage	Aromatic	TShs [1,000-1,500]
15	Mbeya	Non-clean	Breakage	Non-aromatic	TShs [2,000-2,500]
16	Mbeya	Clean	Non-breakage	Aromatic	TShs [1,000-1,500]

The rank-ordered logit model analyses how decision-makers combine attributes of alternatives into overall evaluations of the attractiveness and desirability of these alternatives. This model uses the maximum likelihood method to identify how decision-makers rank the alternatives rather than only specifying the alternative they like best. The probability of observing a specific ranking of profiles in the model represents a sequential decision interpretation that first selects the most preferred alternative, then the most preferred alternative among the rest, and this process is repeated. As explained in the Stata manual (StataCorp, 2013), the probability that each of the alternatives is ranked first is conveniently computed under the assumption that the error in each level of attribute is independent and follows an extreme value type I distribution. Consequently, the probability (π_i) that a rice product profile (e.g. X_i=1) was valued higher than other product profiles (X_i=2, 3, …, 16) can be written in the multinomial logit form according to equation (2), whereby the value of a product profile (X_i=1, 2, …, 16) was a function of levels of attribute parameters estimated by the rank-ordered logit model.

$$\pi_i = \Pr\{X_{i=1} > Max(X_{i=2,3;\ldots 16})\} = \exp(X_{i=1}) \Big/ \sum_{i=1}^{16} \exp(X_{i=1}) \quad (2)$$

The probability of observing a specific ranking can be written as a product that represents a sequential decision, as previously described. The rank-ordered logistic regression model was estimated with the Stata software package.

From the conjoint analysis results, a simulation of expected market share was performed to compute the percentage of respondents who prefer each product profile. The simulation showed how much a product's overall preference can be improved (or made worse) by changing its attribute levels one at a time while holding all other attributes constant (Orme, 2010). This study's simulation was based on the logit model that determines the probability of choosing a product as the ratio of a certain rice profile's natural log of the utility to that for all simulation profiles and averaged across all respondents.

Analysis of segmentation and its determinants

The partial utilities generated by the conjoint analysis at individual levels were used to examine segmentation based on consumer preferences. Following Mooi and Sarstedt (2011), such segmentation was performed by using a two-step cluster analysis. In this procedure, a log-likelihood distance measure was applied; it assumes that variables in the cluster model are independent and each continuous variable is assumed to have a normal (Gaussian) distribution. The partial utilities used as clustering variables are standardised, and the Bayesian information criterion is used as the clustering criterion.

After grouping consumers into segments according to their preferences, these preferences were related to other individual and household characteristics: age, sex, matrimonial status, household size, education (whether a person has completed secondary school or higher studies), main economic activity, food expenditure per month, and the frequency of rice consumption. Discrete choice models were used to assess the influence of these characteristics on the likelihood of belonging in a certain segment. The dependent variable is the categorical unordered variable expressing the different segments to which consumers can belong. On the grounds of random utility, a discrete choice model was used where for the i^{th} consumer faced with *J* segments, the utility of belonging in segment *j* is

$$U_{ij} = z_{ij} + \varepsilon_{ij} \quad (3)$$

Following Greene (2012), if the choice of segment *j* is made, it is assumed that U_{ij} is the maximum among the *J* utilities. The estimation of the model provides a set of probabilities for a decision-maker with characteristics x_i such that

$$Prob(Y_{i=j}|x_i) = exp\,(\beta'_j x_i) \Big/ 1 + \sum_{k=1}^{j} exp\,(\beta'_j x_i), \; j = 0,1,\ldots,J \quad (4)$$

The error terms are assumed to be independent, standard normal, random variables.

Data description

The data was obtained in market surveys conducted in the cities of Dar es Salaam and Morogoro in Tanzania. Dar es Salaam accounts for approximately 60% of national rice consumption in Tanzania (Kawamala, 2013), with widely distributed markets. Morogoro is the second largest producer of rice in Tanzania (12%–16% of total production), with approximately 100,000 ha of rice cropping area in 2011 (Bill & Melinda Gates, 2012). Morogoro has two markets and a small number of supermarkets. Production, processing, and marketing efforts in Morogoro, as in several regions in

the country, are directed towards serving Dar es Salaam.

Surveys were conducted with adult consumers identified when going to or coming from purchasing rice. Random sampling was applied in the selection of respondents. In total, 300 consumers were selected for the study, 152 were from Dar es Salaam and 148 from Morogoro. During the survey, consumers responded to a structured questionnaire designed to collect information on their personal characteristics, rice consumption characteristics, and rice consumption preferences. The respondents also ranked 16 cards that showed the rice profiles (Table 2). Table 3 presents a summary of sample characteristics.

Most of the respondents were women because, in almost all cases, they are responsible for food consumption decisions in their households (McIntosh & Zey, 2013). The majority of respondents were married women: 62.7% of the sample. The youngest participants (18–25 years old) were 16% of the respondents, and the largest group combined categories of participants and were between 25 and 45 years old. Households were mostly of medium size and on average included four members (51.3%); smaller households of three persons or less also represented a significant proportion (33.7%).

In terms of education, almost all respondents had some formal schooling (95.7%); those who completed secondary or higher studies were 55% of the sample. Monthly expenditure on food is on average close to 250,000Tsh (≈150USD at the exchange rate of 01 May 2014). However, variation was observed between the two cities due to differences in income levels and the cost of living.

In terms of occupation, most of the respondents were employed (43%), followed by a proportion of respondents who were engaged in trade (25%). A description of consumers' actual behaviour regarding the frequency of rice purchase and consumption is presented in Table 4.

TABLE 4:
RICE PURCHASES AND CONSUMPTION FREQUENCY (PERCENTAGE (SE))

Frequency	Purchases[a]	Consumption
Once per month	46.1 (0.041)	5.0 (0.013)
Once per week	32.9 (0.038)	13.0 (0.019)
Thrice per week	5.9 (0.019)	25.3 (0.025)
Once per day	15.1 (0.029)	52.7 (0.029)
Twice per day		4.0 (0.011)
N	152	300

[a]In Morogoro, information on frequency of purchases was unavailable.

TABLE 3:
SAMPLE CHARACTERISTICS

Variables	Proportion (S.E)
Sex	
Male	23.4 (0.025)
Female	76.6 (0.025)
Marital status	
Single	22.7 (0.024)
Married/Separated/Widow	77.3 (0.024)
Age	
18-25 years	16.0 (0.021)
25-35 years	36.3 (0.028)
35-45 years	27.3 (0.026)
45-60 years	17.0 (0.022)
60+ years	3.3 (0.010)
Household size	
1-3 persons	33.7 (0.027)
4-6 persons	51.3 (0.029)
Greater than or equal to 7persons	15.0 (0.021)
Average (persons)[a]	4.6 (2.379)
Education level	
None	4.3 (0.012)
Primary	40.7 (0.028)
Secondary	27.7 (0.026)
College/university	27.3 (0.026)
Food expenditure per month in TSh[b]	
Less than 100,000	20.7 (0.023)
100,000-200,000	25.7 (0.025)
200,000-300,000	25.0 (0.025)
300,000-400,000	12.0 (0.019)
400,000-500,000	11.0 (0.018)
500,000-600,000	3.7 (0.011)
600,000 and above	1.8 (0.007)
Average (1000TSh)	244.6(159.6)
Occupation	
Trade	25.0 (0.025)
Employed	43.0 (0.029)
Other (agriculture, craft, housewife, unemployed)	32.0 (0.027)

[a]Average values and standard deviations in parentheses.
[b]Exchange rate: 1USD=1660 Tanzanian Shillings (May 2014)

Most of the respondents bought rice monthly or at least weekly (53.9%). Regarding consumption behaviour in the two cities, most of the respondents ate rice in their households every day (56.7%), either once or twice per day. The frequency of rice purchases determined the availability of rice for consumption by the household; hence, an inverse relation between rice purchase and consumption was observed: households purchase a large quantity of rice once for the whole week or month's consumption. Periodic bulk purchasing behaviour is an indicator of the consumers' careful choice regarding which rice type to purchase with an emphasis on quality, that is, consumers want to buy a product of acceptable quality if they are going to consume the product several times.

RESULTS

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Relative importance and consumers' preferences for rice attributes

The results of the conjoint analysis and the rank-ordered logit model are presented in Table 5. Pearson's R and Kendall's tau-b statistics showed the stability of the estimated models between the rice attributes and rank orders of respondents' preference. These statistics suggested high predictive validity for the model. The utility value of levels of rice attributes was based on how respondents ranked the rice profile. Positive and negative values were observed. Preferences for a certain level of an attribute became stronger when the utility values increased.

The conjoint analysis showed that respondents derived utility from the rice produced in Mbeya, whereas rice from Morogoro and Shinyanga had negative utility. With respect to other attributes, utility for aromatic rice was the highest among all attributes; the value declined when rice was non-aromatic. In the case of price, utility declined with an increase in price. Based on importance values, aroma was the most significant attribute for rice consumers and indicated by 30% relative importance; origin was the second preferred attribute (19.9%), followed closely by cleanness (18.5%), price (16%), and breakage rate (15.3%).

Regarding the rank-ordered logit model, the sign of coefficients implied the direction of influence of the rice attribute level to overall preference; the rate of influence of an attribute level became stronger as absolute values increased. Significant results indicated that aromatic rice positively influenced consumers' preference for rice, followed by cleanness, non-breakage, and price.

TABLE 5:
PREFERENCES OF RICE ATTRIBUTES AND AVERAGE WTP ESTIMATES

Levels	Conjoint analysis		Ranked-ordered logistic[a]
	Utility estimate	Relative importance (%)	
Morogoro	-0.23		-0.05 (0.04)
Mbeya	0.25	19.9	0.03 (0.05)
Shinyanga	-0.03		
Non-clean	2.4	18.5	
Clean	4.8		0.62 (0.03)***
Broken	1.6	15.3	
Non-broken	3.1		0.39 (0.03)***
Non-aromatic	3.8	30.3	
Aromatic	7.6		0.98 (0.04)***
TSh [1,000-1,500]	0.7		0.27 (0.04)***
TSh [1,500-2,000]	0.5	16.0	0.24 (0.05)***
TSh [2,000-2,500]	0.2		
Constant	-3.6		
Pearson's R	0.987***		
Kendall's tau	0.950***		
LR chi-square			1205.23***

[a]Base levels of attributes are omitted in the rank-ordered logit to avoid perfect collinearity. **: 5% and ***: 1% level of significance

Simulation of consumers' preference market share

When product profiles are specified in the market simulator, the percentage of respondents who would prefer each profile is estimated. Table 6 includes the results of market simulations of shares of preference. The predicted probability of choosing each of the simulation cases as most preferred was based on the logit model. Simulations are presented in scale from 0 to 100 and assumed to have ratio scale properties.

TABLE 6:
PREFERENCE PROBABILITIES OF SIMULATIONS ANALYSIS

Rice Profile						Score	Logit
Card Number	Origin	Cleanness	Breakage	Aromatic	Price		
16	Mbeya	Clean	Non-Broken	Aromatic	TShs [1,000-1,500]	12.86	31.09%
4	Shinyanga	Clean	Non-Broken	Aromatic	TShs [1,500-2,000]	12.34	19.72%
13	Morogoro	Clean	Broken	Aromatic	TShs [2,000-2,500]	10.34	7.94%
12	Morogoro	Clean	Broken	Aromatic	TShs [1,000-1,500]	10.83	7.92%
9	Mbeya	Non-Clean	Non-Broken	Aromatic	TShs [1,000-1,500]	10.46	7.12%
1	Shinyanga	Non-Clean	Non-Broken	Aromatic	TShs [2,000-2,500]	9.70	6.32%
8	Morogoro	Clean	Non-Broken	Non-Aromatic	TShs [2,000-2,500]	8.11	5.34%
2	Morogoro	Clean	Non-Broken	Non-Aromatic	TShs [1,000-1,500]	8.60	3.63%
11	Mbeya	Clean	Broken	Non-Aromatic	TShs [1,500-2,000]	7.28	2.43%
14	Morogoro	Non-Clean	Broken	Aromatic	TShs [1,000-1,500]	8.43	1.92%
3	Shinyanga	Clean	Broken	Non-Aromatic	TShs [1,000-1,500]	7.24	1.65%
15	Mbeya	Non-Clean	Broken	Non-Aromatic	TShs [2,000-2,500]	4.64	1.51%
5	Morogoro	Non-Clean	Broken	Aromatic	TShs [1,500-2,000]	8.19	1.13%
7	Shinyanga	Non-Clean	Broken	Non-Aromatic	TShs [1,000-1,500]	4.84	0.92%
10	Morogoro	Non-Clean	Non-Broken	Non-Aromatic	TShs [1,000-1,500]	6.20	0.90%
6	Morogoro	Non-Clean	Non-Broken	Non-Aromatic	TShs [1,500-2,000]	5.96	0.46%

The model indicated that rice profile 16 (the Mbeya rice, which is clean, non-broken, aromatic, and sold within the lowest price interval) was the most preferred in Dar es Salaam, followed by profiles 4, 13, 12, 9, and others. Profiles 6, 10, and 7 had the lowest market preference shares.

The cluster analysis generated three segments of consumers in the rice market. A characterisation of these segments based on preference attributes is shown in Table 7.

The first segment includes consumers who ranked the highest importance as origin but were also price conscious. This cluster demonstrated that their preference for clean rice was important and was the only segment that did not assign the highest importance to aroma. For this segment, origin and affordability were the ideal criteria.

TABLE 7
SEGMENTATION OF CONSUMERS BASED ON A CLUSTER ANALYSIS

Attibutes	(1) Origin & price	(2) Pursuit for aroma	(3) True quality
Origin	30.3	14.4	18.2
Cleanness	16.6	13.9	24.5
Breakage	11.1	10.7	22.8
Aroma	15.7	50.3	20.2
Price per kg	26.3	10.7	14.3
Pearson's R	0.833***	0.992***	0.981***
Kendall's tau	0.728***	0.900***	0.917***
N	77	112	111
Proportion in sample	25.7	37.3	37.0

The second segment includes consumers who primarily pursued aroma while other attributes received less attention. The third segment includes consumers who were interested in all aspects of quality. To them, cleanness, breakage, and aroma were important but origin was too. Price was least important to this segment.

The multinomial logit model estimated factors that determine the probability of being in a certain consumer segment. The results are presented in Table 8.

The property of independence of irrelevant alternatives (IIA), which is assumed by the multinomial logit model,

TABLE 8
MARGINAL EFFECTS AFTER A MULTINOMIAL LOGIT ESTIMATION OF CONSUMER SEGMENTS (N = 300)

Variable	(1) Origin & price	(2) Pursuit for aroma	(3) True quality
Sex (1: male)	0.002 (0.074)	-0.041 (0.061)	0.049 (0.057)
Marital status (1: married, divorced or widow)	0.054* (0.049)	-0.017 (0.090)	-0.035 (0.066)
Age (years)	-0.016 (0.023)	-0.033* (0.024)	0.046* (0.029)
Household size (persons)	0.007* (0.025)	-0.008** (0.037)	0.016 (0.042)
Education (1: Secondary education or higher)	-0.064* (0.046)	-0.066* (0.061)	0.131*** (0.045)
Frequency of rice consumption (times per week)	0.041** (0.020)	0.001 (0.035)	-0.044* (0.032)
Food expenditure per month (log)	0.063* (0.044)	-0.074* (0.047)	0.014 (0.040)
Engaged in trade	0.018 (0.051)	-0.084** (0.071)	0.068* (0.052)
Employed	-0.086*** (0.024)	-0.010 (0.070)	0.078* (0.059)
City (1: Dar es Salaam)	-0.233*** (0.070)	0.322** (0.125)	-0.089 (0.115)
Hausman Chi2 (df = 11)	-0.251	-0.088	-2.723
Small-Hsiao Chi2 (df = 11)	7.894	7.903	5.407
Probability of segment	0.25	0.36	0.39

LR chi2 = 39.72***, Log likelihood = -304.59; McFadden Pseudo R2 = 0.06

was tested. The null hypothesis is that the odds (Outcome-J vs Outcome-K) are independent of other alternatives. On examining the test results, we observed that the Hausman chi-square statistic was actually negative and the Small-Hsiao chi-square statistic was nonsignificant. This result was interpreted as strong evidence that the null hypothesis could not be rejected, that is, the IIA was not violated.

Notably, the models predicted the probabilities of segments that closely matched the observed proportions in Table 7 [25.7%, 37.3%, and 37.0%, respectively, for segments (1), (2), and (3)]. We also note that socioeconomic characteristics were significant in influencing the probability of belonging to different segments. The first segment of consumers who attached importance to origin and a reasonable price was significantly influenced by marital status (married, divorced, or widowed consumers had a high probability of belonging to the segment), household size (belonging to larger households increased the probability of belonging to the segment), education (consumers who had not completed secondary school or higher had a high probability of belonging to the segment), high frequency of rice consumption, expenditure on food (large monthly expenditures on food increased the probability of belonging to the segment), and consumers who did not belong to the formally employed category. The location dummy was negative and significant, implying that consumers from Morogoro were more likely to belong in this category. In interpreting these results, the focus on price was assumed to be a result of attempting to manage the food expenditure in large households.

The second segment included consumers interested in aroma. Notably, consumers who were young, from smaller households, had not competed secondary school or higher studies, spent less on food, and not engaged in trade had a high probability of belonging to the segment. The location dummy was positive and significant, implying that consumers from Dar es Salaam were more likely to belong in this category. The segment also included consumers who were assumed to have limited access to information on quality; hence, the focus on aroma was associated with quality cues.

The third segment includes consumers interested in assessing all aspects of quality. Notably, consumers with a high probability of belonging to the segment were older, had completed secondary school or higher, consumed rice less frequently, and engaged in trade or were formally employed. This segment attracted bulk buyers from large households who had access to information on quality or acquired sufficient knowledge and skills to assess quality.

DISCUSSION

When consumers evaluate rice based on the perceived utility value of attributes, they assign the highest utility to attributes they consider most important in their purchase decision. The conjoint analysis and rank-ordered results implied that the most important attribute that defines consumers' preference for rice in Tanzania is aroma, and it accounts for 30% relative importance in the preference attributes. Actual market price in the cities confirms this demand aspect: aromatic rice fetches a higher price than non-aromatic rice varieties in all the markets (Kilimo Trust, 2014; Wilson & Lewis, 2015). The strong preference for aromatic rice in other countries is also highlighted. For instance, in European markets, consumers' demand for aromatic rice varieties, particularly basmati, has increased since the early 1990s due to the increasing number of immigrants from Far East countries and interest in ethnic cuisine (Ferrero and Nguyen, 2004). According to Napasintuwong (2012), aromatic rice (basmati and jasmine) is the highest priced among all types of rice in international markets. In African markets, Bediako-Amoa, Diako, Saalia, Sakyi-Dawson, & Manful (2010) and Anang et al. (2011) have reported that most rice consumers in Accra and Tamale (cities of Ghana) prefer aroma.

In the decision to purchase rice, cleanness is also important; in the study, 18.5% relative importance was observed. Azabagaoglu & Gaytancioglu (2009) find that in Turkey, imported US Calrose rice is more consumed than other varieties because of its cleanness, among other factors. Cleanness is linked to maintaining rice as a convenience food, especially in the city where households prefer to not spend time cleaning and sorting rice. In Dar es Salaam, rice retailers incur additional cost in hiring labour to clean rice to attract consumers. They subsequently earn a premium for cleanness equivalent to between 200 and 400 Tanzanian shillings.

The percentage of broken rice is also important in marketing: 15% of its relative importance explains preference. In Ghana, non-broken or minimal broken rice grain is the second most important selection criterion for urban traders, following cleanness as the first criterion (Kula & Dormon, 2009). Apart from cultural preferences such as observed in Senegal (Demont, Ndour, Rutsaert, Seck, Tollens & Verbeke, 2013a), in international markets, broken rice is considered an inferior product and sold at a much cheaper price than whole rice (Demont, Rutsaert & Verbeke, 2013c). Therefore, high quality often means a large percentage of whole grains (non-broken rice) after milling. Kilimo Trust (2014) explains that in the Tanzanian market, grade 1 quality (with less than 5% broken grains) can at times command a 50% premium. However, very little domestic rice achieves grade 1 quality; poor processing (milling) machines result in a high percentage of broken rice. Hence, traders blend the broken rice with imported rice which has high milling quality to achieve an 'acceptable' quality balance and profit margin. Rice value chain actors can improve rice-processing machines to reduce the breakage of grains.

Lastly, the results revealed that respondents are price sensitive. At a higher price, consumers may fail to buy the preferred variety. For example, consumers who prefer Mbeya and Shinyanga rice due to their strong aroma may not be able to afford these varieties on a regular basis due to the higher market price. Hence, these consumers may buy cheaper rice even when they do not like it. Azabagaoglu and Gaytancioglu (2009) reveal a similar situation in Turkey, in which US Calrose rice is mostly consumed because it is cheaper at the market than a domestically grown variety (Baldo rice).

Although the origin was not significant in the conjoint analysis, it was found to account for 20% of the preference. Another geographic aspect observed was the differences between Dar es Salaam and Morogoro as the consumption markets. The Dar es Salaam market is significantly less likely to be in the segment influenced by origin and price and more likely to be associated with the segment that pursues aroma, in comparison with Morogoro market. According to

the National Bureau of Statistics in Tanzania, the per capita gross domestic product in Dar es Salaam is 2,000,000Tsh (≈1200USD at the exchange rate of 01 May 2014), double the income in Morogoro. Moreover, among the population in Tanzania that lives below the food poverty line in urban areas (8.7%), such as Morogoro, the proportion in Dar es Salaam is much lower (1.0%) (NBS, 2014).

In addition to income, in reference to Delisle (1990) and Lasarte, Rubiera & Paredes (2013), differences in lifestyles, economic activities, and exposure to marketing and reference groups are key factors explaining disparities. The lifestyle in large cities, such as Dar es Salaam, is completely different than that of relatively small towns like Morogoro. Business competition, better information, and market structures close to perfect competition are found in cities, versus the oligopolies observed in rural towns. These aspects should be considered in designing an appropriate marketing strategy.

CONCLUSION

In consumer-oriented markets, food markets are tuned to the requirements of affluent consumers who have more power to demand specific attributes, especially in terms of the quality, health, and safety of their food. Furthermore, as incomes continue to increase, consumers' power to demand specific attributes also increases; thus, the marketing process in terms of supplying products which respond to diversified needs and preferences becomes more complex and competitive. This is also the case for rice. Understanding consumers' preferences for rice attributes is becoming extremely critical to improving rice quality and its marketability by improving competitiveness and securing future rice markets.

The current case of consumers' preferences for rice quality attributes in Tanzania analysed data collected from 300 rice consumers who purchased their rice from local markets, stores, and supermarkets. As rice is frequently consumed, almost on a daily basis, and purchases are made at regular intervals of weeks to months, a careful choice of rice is based on specific criteria to avoid negative experiences. These criteria are associated with consumers' preference attributes.

Conjoint analysis was used to measure individuals' preference structure through the systematic variation of rice attributes. The study found that aroma had the most influence on preference for rice among Tanzanian consumers, followed by cleanness and non-breakage. These quality attributes improve the marketability of rice, while at the same time, keeping in mind that the price should be affordable to consumers. Hence, this study called for the improvement of rice varieties to incorporate attributes desired in rice markets; respondents' greater preference for aromatic rice indicates sufficient market potential for the local farmers growing aromatic rice varieties. In addition, proper post-harvest processing is important for improving rice cleanness and reducing the rate of broken rice.

The study also showed that, in markets, consumers identify rice based on its origin or production region as an extrinsic indication of quality. The challenge associated with origin in the market is the lack of traceability; rice originating from different production regions is often sold as Mbeya, the most preferred origin, as it mostly occurs with geographical indicators (Allaire et al., 2011). Moreover, in the area of production, multiple varieties are being grown. This practice calls for proper identification of rice in terms of variety or certified name, attributes, and nutritional contents to allow consumers to choose their preferred rice. Differences in socioeconomic factors, which are associated with rice preference attributes, indicate the absence of uniformity and provide opportunities to create market niches for different consumer segments.

In this study, four segments were identified: consumers who want convenience and affordability, consumers who prefer aroma taking cues from origin, consumers who embrace all aspects of quality, and consumers who pursue only aroma. With respect to the socioeconomic characteristics, these segments have different characteristics that can be used as indications for market targeting and strategies.

The results from this study provide information to rice producers and marketers as well as researchers, governments, and other development partners regarding consumers' perception of the attributes of rice. The results highlight the significance of strategically incorporating the rice attributes that consumers desire in ongoing crop-

breeding programmes (e.g. aroma). Consumers assess the rice attributes when purchasing rice and make rice purchase choices about their willingness to pay a premium for these attributes. Therefore, sellers and rice producers should invest in such varieties, improve rice-processing machinery to reduce rice impurity and the breakage rate and, consequently, enhance rice marketability and competitiveness. It is also important to take a further step into the estimation of demand from the identified segments; then, the quality improvement efforts of producers and sellers on the supply side also match the demand in terms of quantity.

Further investigations are required to gain more insight into actual behaviour, including the assessment of experience attributes, such as cooking aspects and taste, not included in this study; a sensory evaluation can also be performed to understand preferences. In addition, it is important to assess the demand for rice in the identified segments and the impact that formal standards and grades could have on market efficiency and consumers' purchasing decisions. The study also calls for government and other development partners to support already operating markets in the rice sector through scientific naming of local rice varieties and investing in rice research, especially breeding objectives that incorporate the preferred attributes. Currently, rice farmers and traders face challenges in selling non-aromatic rice varieties, especially during the harvest season. As a result, these varieties are sold at a very low price. This phenomenon highlights the importance for research institutions to focus on improving the aromatic traits in high-yielding varieties and/or improving the yield of aromatic varieties to increase their adoption and to increase producers/farmers' profits and consumers' satisfaction. Investment in advanced rice-processing machinery should also be supported.

ACKNOWLEDGEMENTS

This research paper is part of the first author's Msc studies financially supported by the African Economic Research Consortium in its Collaborative Master of Science in Agricultural and Applied Economics (CMAAE) programme. We are grateful to the African Development Bank for funding this research, conducted through the Support to Agricultural Research for Development on Strategic Commodities in Africa (SARD-SC) Project. We also express our gratitude to the anonymous reviewers for their very helpful comments on the paper.

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