

## Consumers' demand and willingness to pay for rice attributes in Malaysia

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**Abstract:** The growth of the Malaysian's per capita income has generally empowered consumers to have more choices for food, more purchasing power, health consciousness and demand for more nutritional values of their food intake. Motivated by the changes in Malaysian consumer's food choice, a conjoint analysis was performed to investigate Malaysian consumers' demand for rice attributes and how much consumers are willing to pay for the demanded attribute. A conjoint analysis is a method used in identifying and understanding the combined effects of product attributes on preferences for a product or service. In conjoint analysis, utility is the conceptual basis for assessing the value of a product or service, where individuals make decisions between bundles of products based on their budget constraints. The findings suggested that the most important attribute for rice was food safety, followed by taste and size of grain. Consumers were also willing to pay premium prices for the demanded attributes. The findings would have positive implications for the agrifood industry if it responds effectively to translate into business opportunities to these changes.

**Keywords:** Fermented food analysis, microwave assisted digestion, trace metal, DPASV

### Introduction

The food sector has contributed significantly to the growth and development of the Malaysian economy. The past decade has seen rapid structural transformation and urbanization in Malaysia, in the search for better economic and social opportunities. This has resulted to the increase of demand for food. In Malaysia, it is generally observed that the demand for wheat, vegetables, fruits, eggs, seafood products and meat has increased considerably, while the importance of rice as a staple food has steadily decreased (FAO, 2007). Table 1 shows the Malaysian per capita consumption of food commodities over the past 40 years.

The increase in the demand for non-traditional staple food such as wheat and secondary products derived from traditional staple material sources are heavily linked with the increase of consumers' income. The more affluent the consumers, the greater attention they will pay to the quality of foods. The traditional marketing, which was characterized as "production-oriented market", where farmers and processors had significant power in the past, now seems to be irrelevant. The market has turned to a "consumer-oriented market", where affluent consumers have more power to demand, especially in terms of quality, healthy and safety for their food consumptions (Henson *et al.*, 2006).

As the marketing process becomes more complex, identifying consumers' decision-making process when purchasing the food product is very

crucial. One of the determinants for consumers' decision-making is the attribute of the food. Jang *et al.* (2009) pointed out that food attributes has become a main criteria in the consumers' decision-making process and therefore have received much attention in the food marketing literature. Both intrinsic and extrinsic attributes influence consumers' perception of quality of food. Banovic *et al.* (2009) suggested that the quality perception process basically covers two phases; quality expectations are formed at the purchase point (based on perceived intrinsic and extrinsic attributes) and after meal preparation and consumption of the product at home, quality experience is formed when quality expectations are actually confirmed or rejected. Oliver *et al.* (2006) concluded that confirmation or rejection of the expectations further on determines final satisfaction with the product and repeats purchase.

However, in general, quality of food products is largely determined by individual preferences. Rohr *et al.* (2005) supported the idea that food quality is heterogeneous term and consumers' definitions of food quality are formed by individual perceptions. Guerrero *et al.* (2000) also explained that choice and acceptance of food by consumers are complex phenomena, influenced by marketing-related psychological and sensory factors. Any interaction between a consumer and a food product involves the consumer considering and evaluating a range of quality attributes in the food. These attributes will contribute, in differing proportions, to the overall level of satisfaction derived from purchasing or consuming the product.

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**Table 1.** Malaysian food consumption quantity (Kg/ Capita/ Year), 1965-2003

Year	1965	1970	1975	1980	1985	1990	1995	2000	2003	RoG*
Rice (Paddy Equivalent)	177	181	182	163	125	127	130	129	106	-1.329
Rice (Milled Equivalent)	118	121	121	109	83	84	86	86	70	-1.340
Wheat	33	31	28	34	33	31	29	35	65	0.794
Meat	14	15	20	23	29	37	52	45	48	3.939
Pork	6	6	9	9	9	13	14	7	8	1.616
Poultry Meat	4	6	9	10	15	20	33	32	33	6.127
Fruits	59	60	54	57	54	53	55	55	54	-0.139
Vegetables	19	28	22	25	23	23	32	35	34	1.287
Vegetables, Others	14	23	17	18	17	15	22	22	23	0.735
Fish, Seafood	23	24	30	42	44	47	57	60	55	2.487
Freshwater Fish	0	0	0	0	1	1	1	3	3	9.386
Marine Fish, Other	2	2	5	11	11	18	17	17	17	5.813
Eggs	4	6	7	9	10	13	13	12	10	3.540

\*RoG=Rate of growth

Source: Food and Agriculture Organization of the United Nations, 2007

Understanding the relative importance of product attributes influencing food choice at the point of sale is important in the success of new product development (Enneking *et al.* 2007). In order to improve marketability, these attribute need to be incorporated into agricultural and food products so as to satisfy consumer preferences and demands. However, demands for food attributes may vary from one food to another, and unfortunately, there are not much of literature exists on attribute measurement of food products, written about which attributes should be measured. This study therefore attempts to identify the relative importance and willingness to pay of rice attributes demanded by Malaysian consumers, by using Conjoint Analysis (CA).

## Material and Methods

### Theoretical framework

The theoretical framework of this study is based on Lancaster theory of demand. Lancaster's theory argues that consumers derive utility not from goods directly but from the attributes of the goods that satisfy consumer needs and wants. A number of articles have proposed models to explain consumer product purchases based on the characteristics of the products (Baker, 1999). In previous studies, new product development and identification of consumer preferences have mostly focused on techniques such as contingent valuation (CV) and CA. Throughout this study, CA which has been applied in several studies (Van der Pol and Ryan (1996), Baker (1999), Babicz-Zielinska and Zagorska (1998), Ragaert *et al.* (2004), Schobesberger *et al.* (2008) and Ahmad Hanis

*et al.* (2010) will be used to establish the relative importance of different food attributes. Basically, the aim of CA technique is to understand how respondents develop preferences for rice attributes (Hair *et al.*, 2010). Therefore, this study is an exploratory study, to discover what are the attributes demanded by Malaysian for rice products. Steps in using the CA method will be discussed further in the next section.

### Instrument developments

Steps to conduct conjoint analysis are as follows:

#### *Establishing Relevant Attributes and Level of Attributes*

The first stage in conjoint analysis study is to establish the attributes and level of attributes to include in the actual questionnaire. A number of methods exist to identify the demanded attributes for rice products. These include literature review, focus group discussions, and individual interviews. Amongst the techniques, a focus group session was used. Thirty-three adult respondents participated in the focus group session, participants were in various age, gender, ethnic, and education level in order to reflect the actual Malaysian population. Advantages of focus group research include an increased interaction between all participants and the researcher, visual aids and tangible products can be circulated, and areas of specific interest can be covered in greater depth. The aim was both to establish the factors that influence purchasing of rice and to gather information on the most commonly consumed rice which is suitable for use in the main CA study. CA-type questions were also included to ensure that individuals understood them and completed them in a meaningful way.

The data for the study was gathered directly from interview respondents in face-to-face setting based on administration of a prepared questionnaire.

#### Package of attributes and levels of attributes

Primarily, in the focus group session, there were seven potential attributes (taste, packaging, biotechnology, food safety, percentage of damage in packaging, size of grain and price) that could be selected by respondents. Respondents were asked to rank the seven potential attributes based on their preferences. Based on the mean score for each attributes, four attributes were selected as the most important attributes for rice, which are taste, food safety, size of grain and price. The package of attributes that were used in the study is shown in Table 2.

**Table 2.** Package of Attributes and Respective Levels Used in the Study

Attributes	Levels	Description
Taste	Normal rice	Normal rice
	Fragrant rice	Fragrant rice
	Brown rice	Brown rice (nutritious rice)
Food Safety	Conventional	Use insecticides and pesticides in production
	Organic	Free-chemical produced
Size	Short grain	Short grain
	Medium grain	Medium grain
	Long grain	Long grain
Price	0% increase	No increase in price
	10% increase	Increase 10% from the current price
	20% increase	Increase 20% from the current price

#### Experimental design

Having selected the relevant attributes and their levels, hypothetical rice profile with different combinations of attributes was presented to respondents. The combinations of attributes contained one level of attributes from each of the four attributes (taste, food safety, size of grain and price) of this study. The study gave rise to 54 possible combinations of rice attributes (3 x 2 x 3 x 3). However, it is unrealistic to ask individuals their intention to purchase for too many scenarios, and it also could be very tiring and time consuming (Murphy *et al.*, 2004). To reduce the number of profiles to a manageable size, while at the same time maintaining randomness, a fractional factorial design, using SPSS, was used. This reduced the number of profiles to be evaluated to nine. The rice profiles used in this study is illustrated in Table 3. A rating scale from one to ten, with one being not preferred and ten being most preferred was chosen. Respondents rated the combinations of attributes according to their preferences.

#### Data Collection Procedures

A total of 205 respondents from the capital cities of all states in Malaysia were interviewed using convenience sampling. The cities covered include

**Table 3.** Profiles of rice evaluated by consumers

Profile*	Taste	Food safety	Size of grain	Price
1	Normal rice	Conventional	Long grain	10% increase
2	Normal rice	Conventional	Short grain	No increase
3	Normal rice	Organic	Medium grain	20% increase
4	Brown rice	Conventional	Short grain	20% increase
5	Brown rice	Conventional	Medium grain	10% increase
6	Brown rice	Organic	Long grain	No increase
7	Fragrant rice	Conventional	Medium grain	No increase
8	Fragrant rice	Conventional	Long grain	20% increase
9	Fragrant rice	Organic	Short grain	10% increase

\*Combinations of attributes for rice to be scored by respondents according to their preferences.

Kuantan, Kuala Terengganu, Kota Bharu, Ipoh, Kangar, Alor Setar, Georgetown, Shah Alam, Johor Bahru, Seremban, Malacca, Kota Kinabalu and Kuching. The target population was adults with the age are more than 18 years old. Survey was conducted from December 2009 to March 2010. The CA questions were then presented to respondents. Respondents were asked to rate the profiles of rice in the range one to ten (one is the least preferred, and ten is the most preferred). In terms of sampling, Hair *et al.* (1998) suggested that traditional conjoint analysis has no sample size requirements and could be utilized for single respondents; the larger sample size enhances the reliability of the results and allows the researcher to make some generalizations. To provide reliable estimates, Green and Srinivasan (1978) suggested a minimum sample of 100 respondents. For accurate predictions of consumer preferences at the individual level, it is important not only to ask the respondent the right questions, but also to ask a sufficient number of questions. The number of conjoint tasks or questions depends on the conjoint method used in a study. Based on rating score for each combination, the conjoint analysis procedure calculates the contribution of each attribute to the respondent's preference. The contribution of the attribute level is termed as "part-worth utility". The part worth was estimated using OLS (Ordinary Least Squares) analysis. OLS assumes independent product attributes.

## Results and Discussion

#### Profile of respondents

The distribution of demographic profile of respondents is shown in Table 4. The total sample comprises 49.8% male and 50.2% female. The age of respondents were grouped into five categories; below 17 years old, 18 to 30 years old, 31-40, 41-50, 51-60, and more than 61 years old. About 30% were from 18-30 years old, 26.3% from 31-40 years old, 31.2% from 41-50 and 10.7% for 51-60 years old. Only

17 years old, 18 to 30 years old, 31-40, 41-50, 51-60, and more than 61 years old. About 30% were from 18-30 years old, 26.3% from 31-40 years old, 31.2% from 41-50 and 10.7% for 51-60 years old. Only 2% were above 61 years old. Respondents' range of income was grouped into six, below RM1999, RM1000-RM1999, RM2000-RM2999, RM3000-RM3999, RM4000-RM4999 and more than RM5000. About 6% were from below RM999, 17.1% from RM1000-RM1999, 22.4% from RM2000-RM2999, 16.1% from RM3000-RM3999, 16.1% from RM4000-RM4999 and 22.0% from above RM5000. In terms of ethnic, 72.2% were Malay, 10.7% were Chinese, 3.4% were Indian, 10.2% were Sabah and Sarawak Bumiputera and 3.4% were from other ethnics. For respondents' employment, the categories of employment were divided into five categories. The categories were; the government sector, private sector, unemployed, retired and others. 68.3% were working with the government, 12.2% were from private sector, 8.8% were unemployed, 1.0% was retirees and 9.8% were others. Respondent's education level was categorized into never been to school, primary school, secondary school and university or college. Respondents stated the highest level of education obtained when answering questionnaires. About 3% have attended primary school, 62.0% have attended secondary school and 34.6% have attended university or college.

**Table 4.** Profile of respondents (%)

Demographic Factors		Percentage (n = 205)
Gender	Male	49.8
	Female	50.2
Age (years old)	18-30	29.8
	31-40	26.3
	41-50	31.2
	51-60	10.7
	> 61	2.0
	< 999	6.3
Income (RM)	1000-1999	17.1
	2000-2999	22.4
	3000-3999	16.1
	4000-4999	16.1
	> 5000	22.0
	Malay	72.2
Ethnic	Chinese	10.7
	Indian	3.4
	Bumiputera Sabah and Sarawak	10.2
	Others	3.4
	Government Sector	68.3
Employment	Private Sector	12.2
	Unemployed	8.8
	Retiree	1.0
	Others	9.8
	Primary School	3.4
Education	Secondary School	62.0
	University/ College	34.6

RM refers to the Malaysian Ringgit. 1 USD is equal to RM3.02 (as of May 10, 2011)

#### Relative Importance of Attribute for Rice

The results in Table 5 indicate that food safety was the most important attribute for rice, with 34.18% relative importance compared to others. Taste (33.43%) was the second attribute considered by consumers, and the size of grain which constituted

32.39% of relative importance was ranked third.

From the calculation, it can be noted that Malaysian consumers prefer regular or normal rice compared to fragrant and brown rice as the utility was a positive value, which was 0.2817 (Table 5). Meanwhile, these findings were unexpected and suggested that better level of taste for rice, which is fragrant and brown rice were less preferred. The utility for both levels were -0.0786 and -0.2030, respectively. Although these results differ from expectations, there are several possible explanations for this result. It seems possible that these results are due to the price of both fragrant and brown rice. In Malaysia, people who consume fragrant or brown rice generally have a higher than average household income. Other important reasons can be familiarity and lack of promotions. Consumers who are not familiar with brown rice might not be keen to try it. However, through identifying the relevant market segment with offering both fragrant and brown rice at a price that consumers are willing to pay and creating a distribution system can make the product available to the customer in the right place at the right time, both fragrant and brown rice is expected to be preferred compared to regular rice due to the quality offered. The supply sides have to find the right products for the right customers, rather than the right customers for the products.

In describing food safety, conventional rice was less preferred, which had the utility value of -0.2880 compared to rice produced organically, with utility value of 0.2880. This result may be explained by the relatively good correlation between organically produced rice with the consumers' health consciousness. The present findings seem to be consistent with researches conducted by Baker, 1999, Rohr *et al.* (2005) and Schobesberger *et al.* (2008), which indicated that food safety is an important attribute which needs to be considered in terms of food choice. The findings suggested that the Malaysian consumers have a health and safety perspective while consuming rice. Greater consumer preference for organic rice indicated enough market potential for the local farmers. More infrastructure development such as upgrading the production sector to use organic method in production of rice can be applied.

For the size of grain, short grain was less preferred since the utility value was -0.2729 compared to long and medium grain, which has the utility value of 0.1640 and 0.1089 respectively. It seems possible that these results were due to long grain giving better taste compared to short grain.

**Table 5.** Relative Importance of Attribute for Rice

Attributes	Level of Attributes (Constant)	Coefficients	t-value	Utility	Relative Importance (%)
Taste	Normal Rice	6.6989***	44.9605	0.2817	33.43
	Fragrant Rice	-0.1902*	-1.3791	-0.0786	
	Brown Rice	-0.4911***	-3.5599	-0.2030	
Food Safety	Conventional			-0.2880	34.18
	Organic	0.6967***	5.8324	0.2880	
Size of Grain	Short Grain			-0.2729	32.39
	Medium Grain	0.2634**	1.9096	0.1089	
	Long Grain	0.3967***	2.8762	0.1640	
Price	Actual Price	-0.0915***	-13.2728	-	-

Std. error = 2.4189, F = 38.6067

Note: Significance levels are denoted by \*\*\* for 1%, \*\* for 5%, and \* for 10%.

*Willingness to pay (WTP) for attributes demanded*

With an understanding of the relative importance of attributes and the impact of specific levels, it is then possible to conduct further analysis by predicting the WTP for each attribute demanded. The demanded rice needs to be economically viable. It may not be possible to market high-quality rice at a low price level. WTP was calculated by using the formula stated as follows:

$$WTP = \beta_0 / -\beta_{\text{price}}$$

Where:  $\beta_0$  = Coefficients value of non-price attributes $\beta_{\text{price}}$  = Coefficients value of price attributes

Table 6 shows the calculated WTP for each attribute and level of attributes for rice. The WTP calculated were based on the current average price of rice; RM2.40 per kilogram. In terms of attributes, the taste of rice and the size of the grain conferred the highest WTP, in which both were RM4.18 per kilogram of rice. The WTP for food safety of rice ranked third, RM4.17 per kilogram.

For the level of attributes, the highest WTP among level of tastes were fragrant and brown rice. The results indicated that consumers were willing to pay up to RM4.19 per kilogram of rice for both levels of attributes. The WTP for regular or normal rice was RM4.16 per kilogram. From the calculation it was also discovered that the WTP for medium and long grain (levels of the size of grain) were RM4.19/kg. The WTP for short grain was the lowest among levels of the size of grain; RM4.16/kg. For the level of food safety of rice, the WTP for organic rice was higher than conventional rice, which was as expected. The WTP for organic rice and conventional rice were RM4.19/kg and RM4.16/kg, respectively.

**Limitations of the study**

The previous results must be considered in light of limitations of the study. One such limitation relates to the selection of the attributes for rice. While the results of this study demonstrate the potential for using

conjoint analysis method to determine consumers' preferences for rice attributes, this research approach has some limitations. One such limitation, the selected attributes and levels of attributes for rice products, which is difficult to make choice what attributes to include in the study design and what to exclude. In this study, only selected attributes from focus group survey were used. However, it is most likely that there are other attributes of rice products that are important to consumers beyond those considered in this study.

It is also important to consider that, the results of consumers' willingness to pay is only the calculation of consumers' surplus under the demand curve. The individual consumer surplus is the difference between the maximum total price a consumer would be willing to pay for the amount consumers buy and the actual total price. However, in terms of pricing strategy and implementations, the value of WTP calculated based on demanded attributes itself is not the only determinant to set the price of rice products. Other factors such as demographic profiles also need to be considered.

Throughout this study, it was not examined whether the effects of the demographic factors to the demand for rice are significant or not in terms of demand for rice attributes. For example, demand for rice may differ in terms of age groups, income or education levels of consumers. Older people might be more aware about their health and be more selective on dietary intakes, so they change their eating habits by consuming more healthy foods. Other variables such as education level and income could also be important to capture structural changes in terms of food preferences of attributes. Further studies, which take these demographic profile variables into account, will need to be undertaken.

**Conclusions and Recommendations**

The CA for the overall 205 consumers gives some insight into consumer preferences for rice commodity. The "ideal rice" is to be regular rice, organic and long grain. If a matching between supply and what

**Table 6.** Willingness to pay for rice

Attributes	Level of Attributes	Coefficients + $\beta_0$	$\beta_0/\beta$ price	WTP* (RM/kg)	Overall WTP* (RM/kg)
Taste	Normal Rice	6.6989***	0.7318	4.16	4.18
	Fragrant Rice	6.8369*	0.7468	4.19	
	Brown Rice	6.8369***	0.7468	4.19	
Food Safety	Conventional	6.6989***	0.7318	4.16	4.17
	Organic	6.8184***	0.7448	4.19	
Size of Grain	Short Grain	6.6989***	0.7318	4.16	4.18
	Medium Grain	6.8369**	0.7468	4.19	
	Long Grain	6.8369***	0.7468	4.19	

Std. error = 2.4189, F = 38.6067,  $\beta_0$  = 6.6989, Coefficients of price = -0.0915  
 Note: Significance levels are denoted by \*\*\* for 1%, \*\* for 5%, and \* for 10%.  
 WTP\* calculated based on the current average price of rice; RM2.40/ kg.

consumers really need is desired, this requires a new orientation for the “consumer-oriented” market. As proposed by Kotler and Keller (2006), the marketers must identify three parts in a sequence of phases to gain market access. These phases are important to determine the efficiency of delivery sequences from the producer to the target consumer. The phases are choosing the value, providing the value and communicating the value.

Phase one (choosing the value) consists of customer segmentation, targeting and positioning. In the case of demand for rice attributes, marketers have to find the right products for the right customers, rather than the right customers for the products. For example, in the case brown rice, consumers who live in rural area might not familiar with the product. Therefore, the market for the brown rice should focus on urban area, where the possibility of consumers' willingness to buy the product is higher.

The second phase is providing the value, which consists of product features, prices and distribution. Greater consumer preference for organic and controlled-environment rice indicated enough market potential for the local farmers. More infrastructure development such as upgrading the production sector to use controlled environment and organic method in production of rice can be applied. The use of pesticides and insecticides in rice production should be reduced. The dosage of chemicals used in the production must be at the minimum level of requirement.

The task in the third phase is to communicate the value by utilizing the sales force, sales promotion, advertising, and other communicating tools to announce and promote the product. One of the tasks that can be applied is to set the price of rice equivalent with the attributes offered. The Calculations of WTP can help to predict the price of the consumers is willing to pay for their demanded attributes for rice. Labelling of rice in terms of nutritional contents, chemicals used and method of production also could be very useful in order to give freedom to consumer to choose their preferred rice. The study results also found that better level of rice such as fragrant rice and brown rice were not preferred. Although

it may relate to the price of the products, another possible reason might be that familiarity affects the demand for brown rice. Marketers need to promote both mentioned products to consumers to get better demand for the product since all the products are very good in terms of health to consumer.

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