



**UNIVERSITI PUTRA MALAYSIA**

***CONSUMERS PREFERENCES FOR IMPORTED RICE ATTRIBUTES IN  
KLANG VALLEY, MALAYSIA***

**YAH-YA IBRAHIM ABUBAKAR**

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**CONSUMERS PREFERENCES FOR IMPORTED RICE ATTRIBUTES IN  
KLANG VALLEY, MALAYSIA**

By

**YAH-YA IBRAHIM ABUBAKAR**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in  
Fulfilment of the Requirements for the Degree of Master of Science**

**March 2016**



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## **DEDICATION**

My family, my supervisor and co-supervisors and my friends

Thank You All



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Master of Science

## **CONSUMERS PREFERENCES FOR IMPORTED RICE ATTRIBUTES IN KLANG VALLEY, MALAYSIA**

By

**YAH-YA IBRAHIM ABUBAKAR**

**March 2016**

**Chairman : Golnaz Rezai, PhD**  
**Faculty : Agriculture**

Rice is the most important source of calorie intake for the majority of Malaysians. Rice production has increased over the years, however, about 30-40% of domestic rice demand is imported annually not only to suffice shortfall in supply but to meet the need of consumers for certain varieties not produced locally. Recently, spending on importation has become a marked concern as the country's rising per capital incomes, consumers phobia-tic health behaviour and need to cater for certain health condition stimulate increase in the demand and consumption of some imported rice varieties rather than quantity proportionally which consequently led to increased importation to satisfy consumers need. In response, the government is investing efforts to restrict importation through the introduction of hybrids with attributes similar to some of the imported varieties. Consumers' continuous appetite for imported rice varieties with certain quality attributes and government's efforts to introduce rice varieties with similar attributes to reduce the cost of importation make it a priority to explore consumers' preferences for alternative intrinsic and extrinsic attributes of imported rice varieties and willingness to pay for the preferred attributes. This study employed conjoint analysis to determine the relative importance of each attribute and the value consumers attached to each level of attributes.

In total, 500 respondents were interviewed via structured questionnaire consisting of combinations of attribute levels and consumers were asked to provide a rating response from 1-10 (1 = least preferred; 10 = most preferred) to indicate their preferences for a particular combination. Ordinary least square regression was used to reveal consumers' preferences and the magnitude of the coefficients determine the value consumers attach to each attribute. The results showed that price is the most important factor for both intrinsic and extrinsic attributes. For intrinsic attributes, texture is the most important attribute with non-sticky level preferred over the sticky, followed by grain size (long grain is most preferred, followed by medium grain and short grain is least preferred), followed by taste (tasteful preferred over plain taste), followed by aroma (aromatic preferred over non-aromatic) and colour is the least important (creamy white preferred less to white). For non-price extrinsic rice attributes, county of origin is the most important (rice from India-Pakistan is less preferred to rice from Vietnam-Cambodia,

and rice from Thailand is most preferred), followed by environmental concern (organic preferred to conventional), followed by packaging (standard packaged preferred to loosely packaged), followed by nutritional value (rice with high fiber, vitamins and minerals is preferred to rice with minimum fiber, vitamins, and minerals) and quantity is the least important attribute (10kg preferred less to 5kg).

The result of the willingness to pay for non-price intrinsic attributes showed that consumers are willing to pay more per kg for texture (stickiness), taste (tasteful), aroma (aromatic), and less per kg for colour (creamy white), while for grain size, respondents are willing to pay more per kg for medium grain and long grain. The result of the willingness to pay for non-price extrinsic attributes also showed that respondents are willing to pay more per kg for environmental concern (organic), nutritional value (high fiber, vitamins and minerals), packaging (standard packaged), and less per kg for quantity (10kg), while for country of origin, respondents are willing to pay less per kg for rice from Vietnam-Cambodia and rice from India-Pakistan.

This study revealed that introducing certain attributes such as aroma, longer grain, organic, better texture and others will go a long way in meeting emerging consumer need, reduce importation and subsequently improve farmers' income as consumers are willing to pay for these attributes. Thus, the government should improve its effort in motivating farmers and other bodies involved in the hybrid introduction in making it a huge success. Also, consumer preference for extrinsic attributes such as environmental concern and nutritional value showed that consumers are now becoming more concerned about their health. That is, with proper marketing strategy, patronages of organic and brown/undermilled rice will likely increase as these attributes were clearly desired by consumers.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

## **PILIHAN PENGGUNA BAGI CIRI-CIRI BERAS DIIMPORT DI KLANG VALLEY, MALAYSIA**

Oleh

**YAH-YA IBRAHIM ABUBAKAR**

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Nasi adalah sumber yang paling penting dalam pengambilan kalori bagi majoriti rakyat Malaysia. Pengeluaran beras telah meningkat sejak beberapa tahun, bagaimanapun, kira-kira 30-40 % daripada permintaan beras domestik telah diimport pada setiap tahun bukan sahaja untuk mencukupi kekurangan bekalan tetapi juga untuk memenuhi keperluan pengguna untuk jenis-jenis beras tertentu yang tidak dikeluarkan di dalam negara. Baru-baru ini, perbelanjaan pengimportan telah menjadi kebimbangan ketara kerana peningkatan pendapatan per kapita negara, sikap fobia kesihatan oleh pengguna dan untuk memenuhi keperluan bagi tahap-tahap kesihatan yang tertentu telah menggalakkan peningkatan dalam permintaan dan penggunaan beberapa jenis beras import berbanding dengan kuantiti berkadaran telah membawa kepada peningkatan pengimportan untuk memenuhi keperluan pengguna. Sebagai tindak balas, kerajaan melaburkan usaha untuk menyekat pengimportan melalui pengenalan hybrid yang mempunyai ciri-ciri yang sama dengan beberapa jenis yang diimport. Selera pemakanan pengguna yang berterusan terhadap berbagai-bagai jenis beras import dengan ciri-ciri kualiti tertentu dan usaha kerajaan untuk memperkenalkan kepelbagaian padi yang mempunyai ciri-ciri yang serupa untuk mengurangkan kos pengimportan membuatkan ia suatu keutamaan untuk mengkaji pilihan pengguna terhadap ciri-ciri alternatif secara dalaman dan luaran bagi jenis-jenis beras import dan kesanggupan untuk membayar ciri-ciri pilihan tersebut. Kajian ini menggunakan analisis gabungan untuk menentukan kepentingan ciri-ciri tersebut dan nilai yang diberi oleh pengguna bagi setiap peringkat ciri-ciri tersebut.

Keseluruhannya, 500 responden telah ditemubual melalui soal selidik berstruktur yang terdiri daripada gabungan tahap ciri-ciri tersebut di mana pengguna diminta untuk menyediakan maklum balas kadaran 1-10 (1 = kurang dipilih; 10 = paling dipilih) untuk menunjukkan pilihan mereka bagi gabungan tertentu. Regresi biasa kuasa dua terkecil telah digunakan untuk mendedahkan pilihan pengguna dan magnitud pekali digunakan untuk menentukan nilai yang diberikan oleh pengguna bagi setiap ciri-ciri. Hasil kajian menunjukkan bahawa harga adalah faktor yang paling penting untuk kedua-dua ciri-ciri dalaman dan luaran. Untuk ciri-ciri dalaman, tekstur adalah ciri-ciri yang paling penting dengan nasi yang tidak melekit paling dipilih berbanding dengan



yang melekit , diikuti dengan saiz bijiran (bijirin panjang paling dipilih, diikuti dengan bijirin sederhana dan bijirin pendek//), diikuti oleh rasa (yang mempunyai rasa paling dipilih berbanding dengan rasa tawar), diikuti dengan aroma (aromatik paling dipilih berbanding dengan yang tidak aromatik) dan warna adalah yang paling kurang penting (putih berkrum kurang dipilih berbanding dengan putih). Untuk ciri-ciri luaran beras yang bukan harga, negara asal adalah paling penting (beras dari India- Pakistan adalah kurang dipilih dari beras daripada Vietnam- Kemboja, dan beras daripada Thailand paling dipilih), diikuti dengan kebimbangan alam sekitar (organik adalah paling dipilih berbanding dengan konvensional), diikuti oleh pembungkusan (dibungkus secara standard paling dipilih berbanding dengan dibungkus secara longgar), diikuti dengan nilai pemakanan (nasi dengan serat, vitamin dan mineral yang tinggi paling dipilih berbanding dengan nasi yang kurang serat, vitamin, dan mineral) dan kuantiti adalah ciri yang paling kurang penting (10kg adalah kurang dipilih berbanding dengan 5kg).

Keputusan bagi kesanggupan untuk membayar bagi ciri-ciri dalaman yang bukan harga menunjukkan bahawa pengguna sanggup membayar lebih untuk setiap kg bagi tekstur (kelekitan), rasa (sedap), aroma (aromatik), dan kesanggupan membayar kurang untuk setiap kg bagi warna (putih berkrum), manakala bagi saiz bijirin, responden sanggup membayar lebih untuk setiap kg bagi bijirin bersaiz sederhana dan panjang. Keputusan untuk kesanggupan membayar bagi ciri-ciri luaran beras yang bukan harga juga menunjukkan bahawa responden sanggup membayar lebih untuk setiap kg bagi aspek alam sekitar (organik), nilai pemakanan (serat, vitamin dan mineral yang tinggi), pembungkusan (dibungkus secara standard), dan kurang untuk setiap kg bagi kuantiti (10kg), manakala bagi negara asal, responden sanggup membayar kurang untuk setiap kg beras dari Vietnam- Kemboja dan beras dari India- Pakistan.

Kajian ini mendedahkan bahawa pengenalan ciri-ciri tertentu seperti aroma, bijirin yang panjang, aspek organik, tekstur yang lebih baik dan lain-lain akan memenuhi keperluan baru pengguna, mengurangkan pengimportan dan seterusnya meningkatkan pendapatan petani kerana pengguna sanggup membayar untuk ciri-ciri tersebut. Oleh itu , kerajaan perlu memperbaiki usaha bagi memotivasikan petani dan badan-badan lain yang terlibat dalam pengenalan hibrid untuk menghasilkan kejayaan yang besar. Selain itu, pilihan pengguna untuk ciri-ciri luaran seperti kebimbangan alam sekitar dan nilai pemakanan menunjukkan bahawa pengguna kini semakin mengambil berat tentang kesihatan mereka. Oleh itu, dengan strategi pemasaran yang betul , naungan beras organik dan coklat / tidak diproses mungkin akan meningkat kerana ini adalah ciri-ciri yang jelas diingini oleh pengguna.

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I certify that a Thesis Examination Committee has met on 17 March 2016 to conduct the final examination of Yah-Ya Ibrahim Abubakar on his thesis entitled "Consumers' Preferences for Imported Rice Attributes in Klang Valley, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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## LIST OF ABBREVIATIONS

BERNAS	Padiberas Nasional Berhad
CA	Conjoint Analysis
CV	Contingent Valuation
EU	European Union
FAO	Food and Agriculture Organization
GRiSP	Global Rice Science Partnership
IRRI	International Rice Research Institute
IIT	Information Integration Theory
KG	Kilogram
MARDI	Malaysian Agricultural Research and Development Institute
MR	Malaysian Rice
NKEA	National Key Economic Area
PEMADU	Performance Management and Delivery Unit
RM	Malaysian Ringgit
USDA	United states Department of Agriculture
WTP	Willingness To Pay

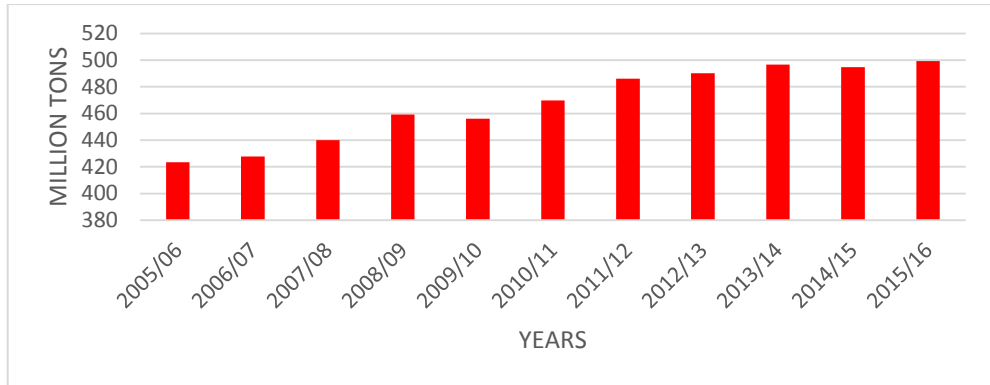
## CHAPTER 1

### INTRODUCTION

Rice is the primary staple for the largest number of people worldwide as it is widely consumed by nearly half of the world's population estimated around 3.5 billion (IRRI, 2013). In Malaysia, rice is the main staple and the most important source of calorie intake for the majority of Malaysians. Rice production has increased over the years, however, about 30-40% of domestic rice demand is imported annually not only to suffice shortfall in supply but to meet the needs of consumers for some quality varieties not produced locally (BERNAS, 2015). Recently, spending on importation has become a marked concern as the country's rising per capital income, consumers phobia-tic health behaviour and need to cater for certain health conditions stimulate increase in the demand and consumption of some imported varieties rather than quantity proportionally which consequently leads to increase importation to satisfy consumers need. Motivated by consumers' continuous demand for some of these quality imported varieties coupled with government's effort to introduce similar varieties to reduce importation, this study tends to investigate the alternative intrinsic and extrinsic attributes of imported varieties which can serve as incipience for future rice grain improvement programs in the country.

#### 1.1 Global Rice Production, Consumption, and Trade

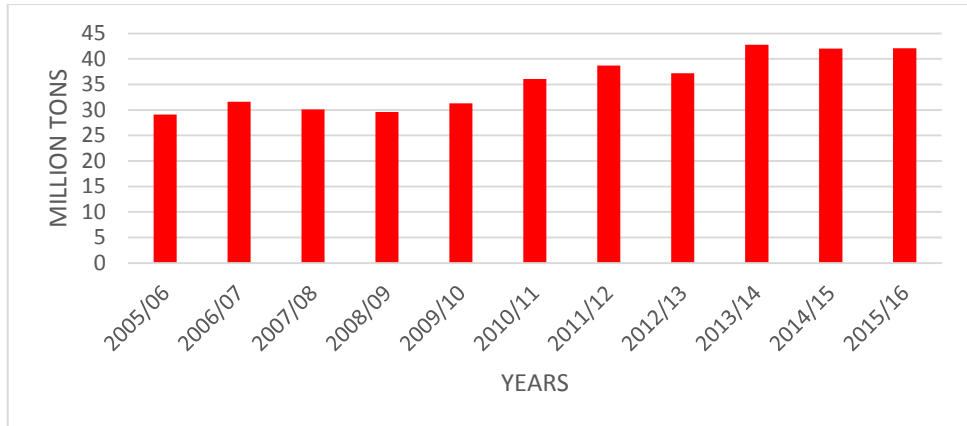
Rice is currently cultivated in over a hundred countries around the world and occupies a high portion of the total harvested area estimated at 159 million ha. Global rice output has risen steadily in the last three decades with a compound growth rate of 2.24% per year between 1961 and 2010. Majorly, the increase in rice production is brought about by an increase in yield which is an outcome of the introduction of modern agricultural technologies that have produced varieties capable of being cultivated up to three times a year. The rise in rice production is witnessed in all parts of the world although growth and yield vary by region. Asian countries account for 91% of total world rice production with almost all countries involved in rice production except Mongolia and countries of Central Asia (Global Rice Science Partnership, 2013). Global rice production is forecasted to increase to about 499.3 million tons in 2015/2016 compared to 494.7 million tons in 2014/2015 (FAO, 2015). Figure 1.1 below shows the trends in global rice production between 2005/2006 - 2015/2016:



**Figure 1.1 Trend in Global Rice Production**  
(Source: FAO World Cereal Market, 2015)

Global rice consumption is driven by population and economic growth in many Asian and African countries. There is a variation in per capita consumption trend of rice in Asia while some countries are experiencing declining per capita consumption, others are witnessing rising per capita consumption. However, declining per capita consumption is often offset by population growth (Global Rice Science Partnership, 2013). Outside Asia, rice per capita consumption continues to rise in sub-Saharan Africa, the Middle East countries, and some Pacific island countries. The same trend was also noticed in Latin America, the Caribbean and in the developed regions such as the United State of America and the European Union (Muthayya et al, 2014). Global rice consumption is forecasted to increase to about 419.6million tons in 2015/2016 compared to 413.8 million tons in 2014/2015 (FAO, 2015).

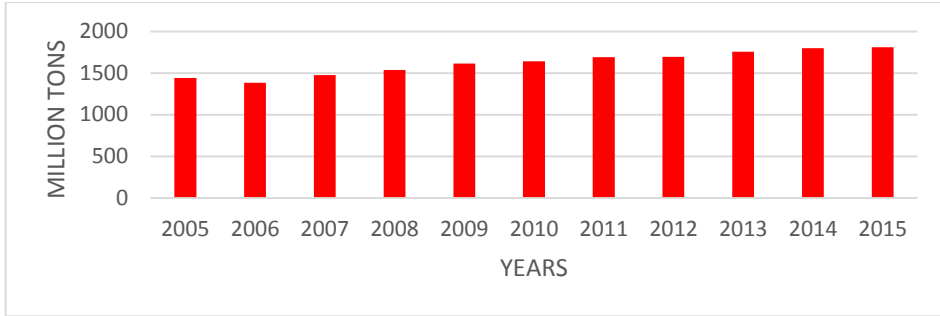
Global rice traded accounts for only 7% of the total rice output which makes the rice market thin and skittish. The volume of rice traded in the international market rise from 7.5million tons in the 1960s to an average of 28.5million tons from 2000 to 2009, 35.5million tons from 2010 to 2012 and reached 42.8million tons by 2014. Thailand has always been the largest rice exporter with an average of 8.8million tons from 2010 to 2014. Vietnam and India are the second and third largest exporters with an average of 8.4million tons and 6.9million tons from 2010 to 2014 respectively. Other key rice exporters are the United State and Myanmar, although exportation fell in these two countries over the years (Global Rice Science Partnership, 2013; FAO, 2015). Figure 1.2 presents the trends in global rice trade:



**Figure 1.2: Trend in Global Rice Trade**  
(Source: FAO World Cereal Market, 2015)

## 1.2 Rice Production and Consumption in Malaysia

Rice is an important crop in Malaysia and has been receiving special attention from the government due to its socio-economic and political significance and also its importance in ensuring food security in the country (Baldwin et al, 2012). Rice production has increased over the year, from 1.32million tons in 1980 to 1.8million tons in 2014 which is about 27% increase. Rice self-sufficiency level still remains around 70%, however, efforts have been made to increase production for every subsequent year through various agricultural policies posed to reduced imported quantity. The focus of the paddy and rice industry is to increase self-sufficiency level through increasing rice productivity. The eight granary area is the hub of paddy production and accounts for 75% of the total planted area in peninsular Malaysia and the remaining 25% is planted in the non-granary area (Abdullah, 2007). The goal of the government is to increase rice production through improving yield and increasing paddy area to 5100 hectares by 2020. Rice production is expected to increase to 1.81million tons in 2015/2016 compared to 1.80million tons produced in 2014/2015. (USDA, 2015; FAO, 2015). Figure 1.3 presents rice production in Malaysia (2005 – 2015):



**Figure 1.3: Rice Production in Malaysia**  
 (Source: USDA Foreign Grain Service, 2015)

Rice is a staple food in Malaysia and serves as the main source of energy for the majority of the population. Malaysian rice per capita consumption has declined considerably, from 161kg/person/year in 1961 to 89.0kg/person/year in 2009 accounting for about 44.7% decline over the period. However, domestic rice consumption continues to increase every year as the decline in per capital consumption is offset by population growth, the country witnessed both rise in domestic population and inflow of foreign workers and also additional income has permitted substitution into better quality rice and other processed rice products (USDA, 2010). Domestic rice consumption is relatively stable and is forecast at around 2.8 million to 2.82 million tons in 2014/15 and 2015/16 respectively (USDA 2015). Figure 1.4 below shows rice consumption trends in Malaysia:



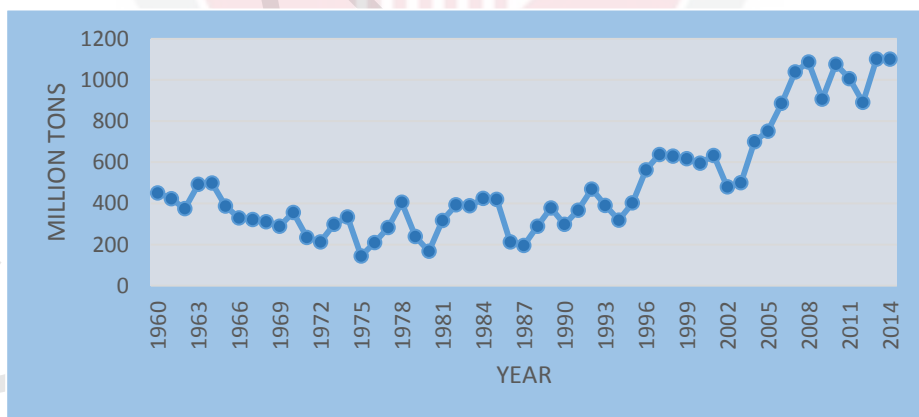
**Figure 1.4: Rice Consumption in Malaysia**  
 (Source: USDA Foreign Grain Service, 2015)



### 1.3 Rice Importation

Many Asian countries will tend to simultaneously export and import different types of rice as consumers diversify their diet and create demand for different types of rice (IRRI, 2012). Malaysia is among the Southeast Asia rice producing countries, however, it remains a net importer with about 1 million tons imported to compensate local production together required to meet the quantity needed for consumption. As more migrant workers settled in the country, coupled with population growth, both local production and importation continue to increase. Between 2012 and 2014, rice importation increased by 23.60% as the country needs to refurbish stockpiles and also meet consumption needs (USDA, 2014).

The self-sufficiency level in the country is about 70% and thus, 30% is imported to meet domestic consumption (BERNAS, 2015). The cost of rice importation has increased dramatically in recent years, not only due to population increase but rapid prosperity and urbanization which stimulate demand for some imported rice varieties with certain quality attributes needed for special occasions, consumption due certain health condition and phobia-tic individuals who perceived it nutritionally superior such as consumption of grain with less starch. As income grows, demand for rice grows less than proportionality as consumer shift to better quality rice or other food. That is, an increase in per capita income does not lead to increase in the quantity consumed proportionally but a shift to better quality rice. Rice importation is expected to rise to 1.15 million tons in 2015/2016. Rice supply into the country is dominated by Vietnam with Thailand and Pakistan occupying second and third places respectively (USDA, 2014; FAO, 2015). Figure 1.5 presents the trend in rice importation in Malaysia (1960 - 2014):



**Figure 1.5: Rice Importation in Malaysia (1960 – 2014)**

(Sources: USDA, 2014)

#### **1.4 Hybrids MRQ74 and MRQ76**

Lifestyle changes, better standard of living, high numbers of tourist and expatriates have contributed to increasing rice importation. The market for imported rice has grown from just a niche market to a commercially attractive one. Given the premium price of some of the imported varieties, there is a potential for domestic production of these types of rice to meet expanding local demand. In addition, scarcity supply due to the increasing demand in the market is an important factor that affects the price of the rice (Jamal, et al, 2013). The Malaysian government has made effort through the National Key Economic Area (NKEA) under the Economic Transformation Programme (ETP) as it announced a new Entry Point Project (EPP) which is to produce fragrance rice in non-granary areas. The government aim to capture 40% specialty rice market with a GNI impact of RM133 million by 2020 and this will result in import reduction, increase farmers' income, reduction in foreign exchange by about USD10-27 million annually, increased self-sufficiency level as higher consumer prices will help pay for strong producer prices and also making quality domestic fragrance rice available for consumers at reasonable price (NKEA MARDI, 2012).

Two specialty hybrids paddy were introduced under the NKEA project, EPP9 (Cultivation of fragrant rice in non-granary areas) namely Maswangi MRQ 74 and MRQ 76 in 2007 and 2012 respectively to compete with the high quality imported rice, reduce importation and increase the income of farmers. Maswangi also known as MRQ 74 is a local quality rice variety that has similar attributes to basmati rice such as long grain after the rice is cooked, High GABA content which reduces stress, Low glycemic index value which makes it suitable for diabetics. MRQ 76 is a high-quality local rice with similar attributes to Thai fragrant rice (Jasmine) and the grain is fragrant and soft after the rice is cooked (MARDI, 2012).

The Maswangi varieties are under cultivation in Kampung Ewa, Langkawi, Perlis, Kedah, Perak, Pahang, Kelantan, Negeri Sembilan and additional 458 hectares suitable for paddy field identified in Lanchang, Paya Lanting, Paya Pesagi Chenor, Jeli, Perlis, and Sik. By 2020, it is expected that 8,000 hectares of land will be planted with the Maswangi varieties. The majority of these would be marketed as organic rice option to consumers. These two varieties remain unavailable in the market as farmers are still adapting to their production requirements as they require less water compared to commercial varieties and also unsuitable to dry weather. The success of this project will reduce the need to import quality rice and will also increase the income of Malaysian farmers. MARDI is the overall project owner and has licensed both production and marketing to Sime Darby and Infoculture Sdn Bhd (ICSB) respectively, as the two anchor partners of this initiative (Pemandu, 2010).

#### **1.5 Consumer Preferences for Rice**

Preference for rice grain is multidimensional; it includes both physical characteristics that influence appearance such as the size and shape, degree of milling (whiteness), Head rice, translucency, foreign matter and damaged grains; and the chemical characteristics that influence cooking quality such as aroma, amylose content, gelatinization temperature, gel consistency, grain elongation (Fitzgerald, 2010).

Consumers express their preferences for rice quality by paying premium for rice with the desired attributes. If the retail price premiums are transmitted back to the farmer through the marketing system, then market participants have the incentive to improve quality (Baldwin et al, 2012). Quality improvements are important in raising national welfare through increasing the value of rice to either consumers or producers, when the cost of producing higher quality can be lowered through research, consumer welfare will be enhanced through the availability of improved quality at lower price. In response, consumers may then demand more rice, and producers may thus gain from an expanded market. The relative importance of quality, however, will vary across countries and over time, due to the nature of consumer preference. With respect to income and prices, preference for better quality is likely to be more elastic than preferences for quantity. As consumer income rises, demand for rice grows less than proportionately, and Asian consumers shift to better quality rice or other foods. Similarly, as prices decline, consumers do not increase the quantity consumed proportionately, but they shift to better quality rice (Unnevehr et al, 2002).

Consumer preference for rice vary across different countries, Indonesian consumers prefer whiter, well-polished rice, with whole grains, fewer yellow or damaged grains, and more amylose than the current low to intermediate levels found in the market. Thai consumers prefer long grain, few broken with intermediate amylose. Glutinous rice (with little or no amylose) is preferred in the north and northeast part of Thailand. Glutinous rice in Thailand has more broken and shorter grains than non-glutinous rice. Broken grains, chalkiness, amylose content and aroma are, most often, significant price determinants for non-glutinous rice while broken grains are the most important price determinant for glutinous rice. The cooking quality attributes of export Thai varieties differ slightly from those found in the domestic market. In Malaysia, Rice varieties have few broken, are slightly shorter on average than Thai rice, and have intermediate to high amylose. However, consumers prefer more head rice and longer shape with low amylose content as premium price is paid for Thai varieties in the market with less amylose content. In Bangladesh, Majority of the rice consumed is parboiled, but raw rice is consumed in some regions. Rice varieties are shorter than those in other countries. Urban consumers prefer less grain weight, more slender grains, less moisture, shorter cooking time, and higher imbibition ratio. Rural consumers prefer less grain weight, more slender grains, and more amylose. For raw rice, there is more variation across regions, but consumers prefer less yellow grain, shorter cooking time and higher imbibition ratio. Hong Kong consumers desire long grain, high head rice percentage, and flaky but soft texture. Italian consumers prefer the attributes of japonicas traditionally grown there, including chalky grains and a non-sticky texture. Bonn consumers' preferences are mainly for physical quality, and consumers there are not well-informed about eating quality (IRRI, 2002).

Eating quality is the primary consideration for Philippine consumers. Consumers prefer non-waxy, medium and long varieties with translucent and intermediate amylose level that remain fluffy and non-sticky after cooking. Japanese consumers are particularly concerned about the appearance of white and brown rice, milling quality and eating quality. Good eating quality for Japanese consumers includes stickiness, sweet flavour, and high gloss of cooked rice, intact whole kernel and good palatability. Taiwanese consumers prefer short and medium grain with minimum amylose content. Korean consumers have preferences for rice with good translucency with low to intermediate amylose content. Spanish consumers prefer short and medium varieties that cook

separate and non-sticky and careless about translucency. German consumers attach high importance to rice that cooks easily and flaky with a relatively hard texture. In India, aroma is rated the highest desired attribute followed by taste and elongation after cooking (Mutters and Thompson, 2009).

## 1.6 Rice Varieties in Malaysia

Rice is an essential staple eaten among all communities in Malaysia. Be it a simple steamed rice (rice cooked through absorption method) served to the delight of the Malay, Indian and Chinese population, steamed rice fried with other ingredients (such as nasi goreng or Chinese fried rice), grain boiled into sweet or tasteful porridge, or glutinous rice steamed and shaped into tubes or cubes, rice remains an important feature of local menus. Local varieties are similar to the Thai rice, although the long grain, fragrant jasmine rice is still prized for its flavour and aroma. Among the Indians, basmati rice is particularly preferred for special occasions and important dishes. The grain should be white, long and silky to touch which should possess a unique fragrance and distinct nutty flavour when cooked. Glutinous rice which is usually white or black in colour with short or long grain which is sticky when cooked and can be molded into tubes, cubes or other shapes. The white variety of glutinous rice makes a good lemang, a Malay sticky rice dish which originated from Negeri Sembilan. This variety of rice is also used to prepare putri salat, a rice based dessert consisting of glutinous rice base covered with thick, sweet, green-coloured custard-like topping which can be sliced into rectangular tiles of green and white (Su-lyn-Tan, 2003).

Many rice varieties have been introduced in the country over the years, the aim of introducing new varieties is to increase production capacity per unit area by planting high-yielding varieties better than existing varieties, to satisfy the tastes of consumers and the reduction of import and quality fragrant rice through the introduction of high-quality varieties. To reduce reliance on pesticide and some other production inputs in realizing production capacity and the preservation of the rice field environment and lastly, the introduction of specialty varieties to meet consumers' taste and industrial needs (Hassan, 2012). Malaysia Agricultural Research and Development Institute (MARDI), the body tasked to carry out research and introduce new varieties including agronomical packaging to support commercialization of the new product has the largest collection of rice genetic resources in the country and has released about 38 varieties so far to increase production capacity and quality (Jamal et al, 2013). The released varieties and their respective years include MURNI, 1972; MASRIA, 1972; JAYA, 1973, S. MALAYSIA 1, 1974; S. MALAYSIA 2, 1974; P. MALAYSIA 1, 1974; SETANJUNG, SEKENCANG, SEKEMBANG, 1979; KADARIA, 1981; P.SIDING, 1981; MANIK, MUDA, SEDERANG, 1984; MAKMUR, 1985; MR 84; 1986; MR 81, 1988; MR 103, MR 106, P.HITAM 9,1990; MR 123, MR 127, 1991; MR 159, MR 169, 1995; MR 185, 1997; MR 211, MRQ 50, 1999; MR 219, 2001; MR 220, 2003; MRQ 74, 2005; MR 232, 2006; MR220CL2, 2010; MR253, MR263, 2011; MRQ76, MR269, 2012 and MR1A 1, 2013. Table 1.1 below shows the released rice varieties:

**Table 1.1: Released Rice Varieties in Malaysia**

Row	Description	Year	Row	Description	Year
1	MURNI	1972	20	P.HITAM 9	1990
2	MASRA	1972	21	MR 123	1991
3	JAYA	1973	22	MR 127	1991
4	S. MALAYSIA 1	1974	23	MR 159	1995
5	S. MALAYSIA 2	1974	24	MR 169	1995
6	P. MALAYSIA 1	1974	25	MR 185	1997
7	SETANJUNG	1979	26	MR 211	1999
8	SEKENCANG	1979	27	MRQ 50	1999
9	SEKEMBANG	1979	28	MR 219	2001
10	KADARIA	1981	29	MR 220	2003
11	P.SIDING	1981	30	MRQ 74	2005
12	MANIK	1984	31	MR 232	2006
13	MUDA	1984	32	MR220CL1	2010
14	SEDERANG	1984	33	MR220CL2	2010
15	MAKMUR	1985	34	MR253	2011
16	MR 84	1986	35	MR263	2011
17	MR 81	1988	36	MRQ76	2012
18	MR 103	1990	37	MR269	2012
19	MR 106	1990	38	MRIA 1	2013

Source: (Hassan, 2012)

MR 219 and MR 220 have been planted for more than 20 seasons in more than 90% of the planted areas in the country. These quality varieties have a fairly long grain with an intermediate amylose content favored by the majority of Malaysians (Bashar et al, 2014).

### 1.7 Imported Rice Varieties

There are several imported rice varieties apparent in the market, these include imported ordinary white rice, brown unpolished rice and specialty rice such as fragrant rice, basmati rice, parboiled rice, glutinous rice and Calrose rice (Bernas, 2015). The import of some of the specialty rice shows an upsurging trend every year with a value of RM500 million. In 2012, out of 1.01 million tons (RM 1.854 million) of rice imported, 0.63 million tons (RM 1.096 million) are specialty rice varieties. The attributes of some of the imported varieties are described below:

### 1.7.1 Basmati Rice

Basmati rice (queen of fragrance) is a variety of long, slender grain aromatic rice which originated from India and Pakistan (FAO, 2002). It is cultivated traditionally in the Himalayan foothill regions of India and Pakistan and the name is traditionally associated with this geographical origin (Bligh, 2000). Basmati rice is highly preferred and so command a very high premium price in both international and domestic markets. The price is usually the same and sometimes valued higher than jasmine rice (Napasintuwong, 2012). Basmati rice is characterized by extra-long super slender grains with chalky endosperm and a shape like a Turkish dagger, pleasant and delicate aroma, sweet taste, dry, fluffy and soft after cook texture, delicate curvature, low amylose, medium-low gelatinization temperature, 1.5 to 2-fold lengthwise elongation with least breadth-wise swelling on cooking and tenderness of cooked rice (Siddiq et al., 1997). Basmati rice is non-waxy, non-glutinous rice with Length-wise expansion (grain elongation) upon cooking without an increase in girth and does not stick. The characteristic sweet aroma of Basmati rice is released when the grain is cooked and is said to resemble the aroma of the flowers of *Madhuca longifolia*. Basmati rice takes a relatively longer time to cook than other common rice varieties and has the highest water uptake values of  $354 \pm 356$ g/100g of rice compared to  $217 \pm 352$ g/100g for other rice varieties. Basmati rice has a medium glycemic index (between 56 and 69) compared to regular white rice with a glycemic index of 89, thereby making it more suitable for diabetics as compared to certain other grains and products made from white flour (Canadian Diabetes Associate, 2013).

### 1.7.2 Jasmine Rice

Jasmine rice (Thai hom Mali or Thai fragrant rice) is a long-grain variety of rice that possesses a sweet aromatic fragrance, a subtle pandan-like aroma (Wongpornchai et al, 2003). It is cultivated primarily in Thailand, and to a lesser degree in Laos, Cambodia, and southern Vietnam. Among rice traded in the world market, Thai jasmine has been given the highest value compared to other regular white Thai varieties and the price of Thai Jasmine rice is nearly double the price of regular Thai white varieties. Jasmine rice is continuously being an important export commodity of Thailand as it generates the highest value of exports among all rice export commodities from the country. The grains cling and are somewhat sticky when cooked, it is about three times more sticky than the long grain American rice though less sticky than the short grain glutinous rice. It is moist and soft in texture when cooked, with a slightly sweet flavor, freshness and maximal fragrance (Napasintuwong, 2012).

### 1.7.3 Glutinous Rice

Glutinous rice (sticky rice, sweet rice or waxy rice) is cultivated mainly in Southeast and East Asia. It is grown in Laos, Thailand, Cambodia, Vietnam, Malaysia, Indonesia, Myanmar, Bangladesh, Northeast India, China, Japan, Korea, Taiwan, and the Philippines with an estimated 85% of this type of rice cultivated in Lao. It can be white or black in colour, opaque grains, very low amylose content, and is especially sticky when cooked. Like all types of rice, glutinous rice does not contain dietary gluten, it is

described as glutinous due to its feature of being glue-like or sticky, and not in the sense of containing gluten.

#### **1.7.4 Brown Rice**

Brown rice (cargo or the whole rice) is essentially what all rice variety look like before it is put through a refining process. It is an unpolished whole kernel produced by removing the hull or husk of paddy or rough rice while leaving the other layers intact. It retains the bran, germ, and some parts of the endosperm. When the outermost shell is removed from the rice paddy; not all dehulled rice is brown, the bran and the germ layer determine the rice colour which may be distinctly brown, reddish, purple and even black. Any rice including the medium grain, long grain or short grain can be consumed as brown rice. Brown rice has lots of health benefits, it is rich in plant lignin which helps build healthy gut flora. It is rich in dietary fiber, vitamins, and minerals, it contains phytic acid (antioxidant and anticancer) and also considered a low glycemic index food (low fat and high complex carbohydrate which reduces the risk of type 2 diabetes). Brown rice consumption is also associated with weight loss, reduced learning, and memory deficits and also been found to be rich in phytonutrient as in fruits and vegetables (Babu et al, 2009).

#### **1.7.5 Parboiled Rice**

As in the case of brown rice, any rice variety can also be parboiled through parboiling process. Parboiling is a hydrothermal process that includes soaking, pressure steaming and drying, followed by dehulling and removal of bran and germ. The procedure gelatinizes the starch in the grain and ensures a firmer and more separate grains. The process of parboiling transfer some of the nutrients located in the outer germ to the endosperm where they remain available to the consumers. Also, some sensory changes occur, such as a pale yellowish colour, grains with a harder texture even after cooking and a characteristic flavour (Behrens et al, 2007). Parboiled rice has about 80% of the nutritional value of brown rice when it comes to nutritional structure, the vitamins in parboiled rice are similar to those found in brown rice.

#### **1.7.6 Calrose Rice**

It originated and grown in California, United States of America and other areas of the world where growing conditions are suitable, such as Australia. The name "rose" represents the medium-grain shape and "Cal" represents the California origin. It is a medium-grain rice and when cooked the grains are softer, moist, sticky and hold flavor well. The cooked grains are soft and stick together, making it suitable for use in sushi.

## 1.8 Rice Attributes

The value of rice market chain is largely determined by the quality trait of the grain. The sensory properties of different varieties of rice such as the taste, aroma, and texture determine the reputation of the rice while the physical properties such as the appearance (translucent/ chalky appearance), percentage of head rice (whole/ broken grain), grain size, shape and colour determine the economic value of the rice grain (Fitzgerald, 2010). The physical properties play an important role in pre-purchase and pre-consumption evaluation as it is significant in consumers' initial psychophysical judgment of the product value while the post-consumption evaluation establishes the sensory experience of the food. Consumers express their quality preference by paying a premium price for the products with the desired characteristic as they face a trade-off in their purchase decision since income is limiting and choice are numerous. When making purchase decisions, budget constraint and preference are considered, budget constraint pertains to consumer's income and price of the product while preference is often based on the product attributes. It is assumed that once consumers recognize their preferences, they are prepared to pay more for variants that better suited their taste (Rachmat, 2006).

Consumer preference for rice varies from country to country. However, consumers are always concerned about quality and price when they make purchase (Diako et al, 2010). The quality of a food product is determined by individual preference which is formed through individual perception about various attributes of the food. Food quality is heterogeneous and consumers' definition of food quality is formed by individual perception (Rohr et al, 2005). Individual perception of food quality shapes their attitude towards the product. Consumer attitude represents the sum of experience and information about a product and the response evoked as positive or negative towards the product (Schiffman and Kanuk, 2000). Consumer preference towards rice can then be delineated as the intensity of feeling in favour or against the product motivated by the product attributes and also by beliefs. Attributes are criteria relevant to consumers in a specific situation in which consumers hold specific beliefs, consumer belief about attributes combined with attribute important weight results into product preference which may be further be translated into purchase intention (Pieter et al, 2013).

Food attributes are classified into search attributes, experience attributes and credence attributes (Grunert, 1997). Search attributes are those attributes that are evaluated by consumers prior to purchase, this includes appearance (whole/broken), grain size, shape and outlook. They are critical for pre-consumption acceptance as they provide the only means to evaluate the quality of the raw rice grain prior to purchase. Experience attributes are those attributes evaluated only after purchase in which consumer usually deduce preference from substitute indicator. This includes rice attributes such as taste, aroma, texture and swelling capacity. Experience attributes provide consumers with actual consumption experience and may attract consumers to have a repeated purchase or otherwise based on the satisfactory rating of food quality as regards individual initial beliefs. Credence attributes are not revealed by experience and consumption, it's generally the question of the credibility of the food product in which consumers are reliant on third parties such as government control and industrial claims to evaluate the attributes of the product, this type of attributes are generally related to production, processing and product contents (Darby and Karni, 1973). Credence attributes includes product attributes such as food safety, nutritional claim,



country of origin, packaging and brands which are very important attributes and can increase the acceptance of a food product if they can be successfully transformed into search attributes (Pieter et al, 2013).

## **1.9 Intrinsic and Extrinsic Attributes**

Food attributes are grouped as either intrinsic or extrinsic attributes. Intrinsic attributes are related to the product physical characteristics while the extrinsic attributes are product related but not a constituent of the physical product itself.

### **1.9.1 Intrinsic Attributes**

Intrinsic attributes refer to the physical characteristics of the food product itself, which cannot be changed without also changing the product (Bello et al, 2000). These includes the physical appearance, sensory and cooking properties of the rice grain. The physical appearance of the rice grain is very important for consumer acceptance and varies from one group of consumer to another while a group prefers the short and bold grain, another group might prefer the long and slender grain. The sensory and cooking attributes are often important in the analysis and evaluation of flavour and texture with emphases on the texture attribute. Consumers in one setting might prefer the aromatic and sticky rice, the non-aromatic and non-sticky might the choice of another setting. The sensory and cooking properties are very crucial experience attributes that can influence a consumer repeated purchase intention. Both the cooked and raw sensory attributes dictate consumer preference. The appearance of raw rice sold in the market is the most crucial attribute that influence consumer preference, but the appearance of cooked rice though important does not determine consumer preference as much as taste and aroma of the cooked rice (Diako et al, 2010).

### **1.9.2 Extrinsic Attributes**

Extrinsic attributes refer to everything else about a product, which are not physically part of the product such as price, packaging, brand, nutritional label, outlet and country of origin (Bello et al, 2000). Consumers are increasingly becoming aware of their health and the importance of the safety content of their food, this has changed the scope of consumer preference from traditional attributes such as taste and aroma to include the nutritional attribute and safety (organic/conventional) of the rice grain. Packaging and outlet are also very importance factors as consumers are now moving from traditional open markets to more organized grocery stores and supermarkets/hypermarkets. The extrinsic characteristics describe the predictive validity of a product prior consumption through various marketing activities and information including price, nutritional and food safety labels, outlet, brand and country of origin. It communicates both the experience and credence attribute of the food product, however, the intrinsic characteristic is more successful in predicting experience attributes. Price is a very important extrinsic attribute, especially when analyzing the relationship between market price, acceptability, and affordability in relation to product attributes. As market price increases due to improved quality,

affordability decreases and acceptability increases. That is, consumers might make tradeoff between increasing quality attributes and increasing market price, and increasing affordability and decreasing product quality. The variation of consumer affordability with sensory attributes suggest that the concept of acceptability, affordability, and market price have widely different meaning to consumers (Tomlin et al 2007).

### **1.10 Problem Statement**

Growth in prosperity and rapid urbanization has led to changes in Malaysian consumers attitude towards food, consumers are now more empowered to have more choice of food intake and better informed about the quality attributes of the food they eat. Rice is an everyday food for the majority of Malaysians and as income increases, consumers' demand for better quality and varieties with more desirable attributes. Evidence to this can be seen in the market with the presence of several varieties with different attributes. This shows that consumers have diversified their diet which has created demand for different types of rice, thereby spending more on higher quality that will satisfy their appetite rather greater quantity.

About 30-40% of domestic rice demand is imported annually not only to suffice shortfall in supply but to meet the need of consumers for varieties not produced locally. Recently, spending on importation has become a marked concern as the country's rising per capital income stimulates increase in the demand and consumption of some imported varieties with certain quality attributes for special occasions, consumption due certain health condition and phobia-tic individuals who perceived it nutritionally superior such as consumption of grain with less starch. The market for some imported rice has transformed to a commercially attractive one, given the premium price, there is a potential for domestic production of these types of rice to meet expanding local demand.

Thus, in reducing importation, emphasis should not just be prioritized on increasing yield but also on introducing certain attributes to meet emerging consumers' need. This is also recognized by the government as it has been planning to introduce hybrid varieties with attributes similar to some of the imported ones. The aim of the government is to capture 40% imported rice market by 2020 which will result in import reduction, increase farmers' income, reduction in annual foreign exchange spent on imported rice, increased self-sufficiency level.

Rice varieties imported rice into the country are of different types each with distinct attributes such as taste, texture, aroma, colour, grain size and from different countries such as Thailand, Vietnam, and Pakistan. Also, globalization has triggered the quality, standard and preference for food which has transformed consumer preference for various food products. Consumer preference for rice has evolved from just the physical attribute of the rice to involve information about the safety, nutrition and quality packaging. consumers now evaluate food based on certain extrinsic cues such as information about the safety and nutritional value of the food they consumed. Packaging, labeling, and branding are also important extrinsic cues as they counter the effect of quality uncertainty, they entail market differentiation potentials which might

be noticeable by consumers depending on what label appeal to their health, safety and taste specification. When producers cannot signal the quality of their product, consumers' choice are predicted on the perceived average quality in the market which might lead to market failure.

It becomes crucial to determine the important attributes demanded by consumers in the imported varieties, and also, the willingness to pay for the preferred attributes. This is important for both the marketing perspective and as an incipience for present and future rice grain improvement. The study employs a consumer-oriented approach which provides a platform to determine how the different attributes possessed by these varieties make consumer prefer them more and how changes in grain size, texture, aroma and others rice attributes will influence future consumer choice.

### 1.11 Objectives of the Study

The general objective of the study is to investigate consumers' preferences for imported rice attributes. The specific objectives are:

- a. To determine the significant attributes influencing consumer preferences for imported rice.
- b. To determine the utility and relative importance of consumers in choosing combinations of attributes.
- c. To estimate the willingness to pay for each level of attribute demanded.

### 1.12 Research Questions

The foregoing objectives were achieved by developing specific research questions to be analyzed. Table 1.2 illustrates the research questions of the study. The research questions were answered by data obtained from consumer survey using the rating-based conjoint.

**Table 1.2: Overview of Research Questions**

Research Questions	Measurement
1. What are the most important intrinsic and extrinsic attributes influencing consumer preference for imported rice?	Consumer ratings on metric scale: Relative impact of each attribute based on their relative importance scores
2. What level of attribute constitutes the highest contribution for each attribute?	Consumers ratings on metric scale: The utility value (coefficient value) of each level of attributes relative to the utility value of other levels of attributes
3. How much is consumer willing to pay for each level of attribute demanded?	Calculations by dividing the coefficient value of non-price attributes by the coefficient value of price). Comparison of willingness for each level of attributes

### **1.13 Significance of the Study**

The purpose of the study is to determine the most important attributes influencing preferences for imported rice among Malaysian consumers. The research will allow us to 1) identify the important attributes and level of attributes, 2) examine the preference structure of consumers based on the important imported rice attributes and 3) estimate the willingness to pay for the preferred attribute levels. This study will provide information about consumer preference in the face of rapid prosperity and urbanization which can be adopted to improve consumers' welfare. This will serve as strategies and action plans which can be carried out by actors in the rice industry (farmers, processors, and retailers) and relevant government agencies. It will also provide important information about consumers' need in which all actors involved in research and development can gear their research priorities. This is very crucial due the constant changes in consumers' food choices and, therefore, contributes to the development of the rice industry as it will provide information necessary to avoid a mismatch between the supply and demand sides. The information will enhance consumer welfare and increase demand, producers may thus benefit from an expanded market.

### **1.14 Organization of the Study**

The study was organized as follows; Chapter 1 explained global production, consumption, and trade of rice. Rice production, consumption, and importation in Malaysian. Consumer preferences for rice, rice varieties in Malaysia and rice intrinsic and extrinsic attributes, problem statement, objectives, and significance of the study. Chapter 2 presented reviews of literature relevant to the research problem. Chapter 3 describe the theoretical framework, methodology and sampling procedure. The results of the study were described in chapter 4 and chapter 5 presents conclusion and recommendation based on the result discussed in chapter 4.

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