

Consumers behavior and rice attributes for Thai hommali rice in Sichuan province of China

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Abstract

During 2012-13, Thailand loses its price competitiveness due to the rice pledging policy. This enables Vietnam, and Pakistan to take over the Chinese rice market. Although, the pledging policy is abolished in 2014, Thailand is slowly regained its rice market share in China. With impressive economic growth, huge population and the Look West Policy of China created a great potential for a new market for Thai HomMali rice in the Sichuan Province where 81 million people with 8-9 percent of economic growth during 2014-15. Chengdu, the capital, experienced an increase in GDP per capita 9-10 percent and the food expenditure per capita grows at 8 percent. To facilitate a better understanding for this new market, consumers' preference for Thai HamMali rice is needed and the implicit price of the important attribute of HomMali rice should be investigated. This study employed consumer survey of 412 samples in Chengdu and using the hedonic price model to analyze the implicit price of each attribute for HomMali Rice. The results show that modern trade, supermarket, and convenient store are the main marketplaces to purchase rice of Chengdu consumers. The softness and taste of Thai HomMali are the major factors that consumer preferred. Those consumers buying Thai rice have comparatively higher income and education, and have more cheerful lifestyle. The empirical results of consumer preference reflected that significant attributes influencing price are color, broken rice, new-season rice, rice standards, rice brand, softness, taste and fragrance. The implicit price of Thai rice depends more on cooking and eating quality. As a result, to make Sichuan province to become a potential high quality Thai rice market, Thai government and traders should create product differentiation by emphasizing on Thai rice quality and standard in terms of physical quality, cooking and eating quality according to the Chinese demand.

1. Introduction

China is the number one importing country in the global rice market. Its rice import increased from 2.9 million tons in 2001/02 to 4.5 million tons in 2014/15 (USDA, 2014). Actually, rice import in China is controlled by the central government under the import quota system at 5.22 million tons per annum in which 50% is for short grain rice imports while the rest is for long grain rice. China started importing long grain rice in 2002 with total quantity imports of 216,214 tons. Thailand has been the sole exporter in the market that most exported HomMali rice. Since then, the quantity imports have been increasing and Vietnam started to enter the market. During 2006- 2010, Thailand market share was the highest, on the average more than 90% of the long grain rice imports of China is from Thailand. However, the Thai market decreased drastically during 2012-2013 due mainly to the rice pledging program that raised the Thai rice price higher than the world price, as the results, Thailand loss the price competitiveness to other major rice exporting countries, especially Vietnam and Pakistan and most of the Thai market shares are taken by those countries.

Nevertheless, the abolishment of the rice pledging program in 2014 lead to the decrease in Thai rice import price in China which closed the rice price gap between Thai and Vietnam. Eventually,

Thai rice gradually regains its market share (data from Global Trade Atlas in 2016 showed in Table 1-2)

Country	Total quantity imports of long grain rice (Million ton)							
	2004	2005	2008	2010	2012	2013	2014	2015
Total	0.746	0.478	0.271	0.309	1.922	1.423	1.485	1.837
Thailand	0.716	0.437	0.269	0.252	0.121	0.159	0.504	0.688
Vietnam	0.029	0.041	0.001	0.056	1.309	0.999	0.695	0.658
Pakistan	-	-	-	-	0.478	0.245	0.250	0.386
Cambodia	-	-	-	-	0.003	0.02	0.037	0.101
Myanmar	-	-	-	-	-	-	-	0.004
Percentage share of total quantity imports of long grain rice								
Thailand	91.5	99.4	81.8	6.3	11.2	33.9	37.4	91.5
Vietnam	91.5	99.4	81.8	6.3	11.2	33.9	37.4	91.5
Pakistan	8.5	0.5	18.0	68.1	70.2	46.8	35.8	8.5
Cambodia	-	0.2	0.1	24.9	17.2	16.8	21.0	-
Myanmar	-	-	-	0.2	1.4	2.5	5.5	-

Table 1 China quantity and percentage share of long grain rice imports from major exported countries

Country	Imported price of long grain rice from various exporting countries (US\$/ton)							
	2004	2005	2008	2010	2012	2013	2014	2015
Thailand	338	406	639	803	1000	985	588	543
Vietnam	220	195	300	398	447	416	459	446
Pakistan	-	446	990	963	484	450	414	376
Cambodia	-	-	-	-	872	915	758	639
Myanmar	-	257	-	-	-	-	489	485
Long grain rice price difference between major exporting country (US\$/ton)								
Thailand-Vietnam	118	211	340	405	553	569	128	97
Thailand-Pakistan		-40	-351	-160	516	535	174	167

Table 2 Imported price of long grain rice from Thailand compared with other countries

With the existing large population and high economic growth rate, China has a high economic potential in importing rice with strong demand for HomMali rice from Thailand. However, the preferences for rice consumption in China are varied across regions. For example the Chinese living in the Northern part of the Yangtze River prefer consuming short gain rice, while those living in the Southern part prefer consuming long grain rice. Guangdong province (Guangzhou city and Shenzhen city) is the major market for Thai HomMali rice; nevertheless, this market is facing with high tendency of price competition from the Vietnamese rice.

Provinces in the Western region of China, especially Sichuan Province has great potential for market expansion for HomMali rice. This due mainly to the "Look West Policy of China" that generated high economic growth to Sichuan Province which was more than 10% growth during 2010-2013, and between 8-9% during 2013-2014 which is comparatively higher than those cities that currently sell Thai HomMali rice. (Table 3)

Region/city	GDP 2014		GDP growth rate (%)				
	1,000Mil. RMB	2010	2011	2012	2013	2014	2015
Sichuan	2,854	15.1	15	12.6	10	8.5	7.9
Chengdu	n.a.	15	15.2	13.1	10.2	8.9	
Guangdong	6,781	12.5	10	8.2	8.5	7.8	8
Shanghai	2,357	10.3	8.2	7.5	7.7	7	6.9
Beijing	2,133	10.3	8.1	7.7	7.7	7.3	6.9

Source: retrieved from CEIC database, 2016

Table 3 GDP and GDP growth rate of major region and city that selling Thai HomMali rice

Sichuan Province is one of the most populated province in which 81 million people are

registered. Chengdu, the capital of Sichuan, experienced the GDP growth of 9-10 percent during 2013-2014 with a sharp increase of GDP per capita of 9 percent growth rate (Table 4 and 5). These increases enable people to enjoy better standard of living and changes of consumption behavior, especially the increase of food expenditure that increased by 8 percent (Table 4 and 5) and consuming more variety of quality food items. Particularly, those consumers under 35 year-old are spenders of high quality products. In addition, tourism to Thailand become increasingly popular for people in Chengdu, and once these tourists experienced with fragrant and aroma taste of HomMali rice create a demand for more imports of HomMali from Thailand (information obtained from an interview with staffs of Thai Consulate in Chengdu during March 2014).

The comparison per capita food expenditure and annual growth rate among the 5 major cities in China shown that during 2005-2013 Chengdu's per capita food expenditure fastest increased at 54 percent followed by Guangzhou (52 percent), Shanghai (50 percent), Shenzhen (49 percent) and Beijing (48 percent). During 2011-2013, the growth rate of food expenditure of Chengdu were comparable as those in Shenzhen and Beijing in the range of 7 to 13 percent. Obviously, Chengdu is on par with the forefront fast growing cities of China (Table 6)

The acceptance of HomMali rice, the sharp increase of per capita income, and changing consumer food expenditure of young people in Chengdu are evidence of potential market expansion of Thai rice market in Sichuan province. Moreover, the famous Sichuan cuisine (Sichuan Mala "numbing and hot") is very different from the Cantonese cuisine in Guangdong province where the traditional Thai rice market is. Therefore, to have a better understanding and formulation of consumer behavior on Thai rice that enables an appropriate formulation of strategy marketing plan for this new market in Sichuan province of China, the study on Chinese consumer behavior of Thai Ham Mali rice and the importance Thai rice attributes are needed. The analytical of this paper only focuses Chengdu consumers.

City	GDP Per Capita (RMB/Year)				Growth rate (%)		
	2005	2012	2013	2014	2012	2013	2014
Chengdu	19,627	57,624	63,977	70,019	16.6	11	9.4
Shanghai	49,649	85,373	90,993	97,343	3.4	6.6	7
Beijing	45,993	87,475	94,648	99,995	7.1	8.2	5.6
Guangzhou	53,809	105,909	119,695	n.a.	8.5	13	n.a.
Shenzhen	60,801	123,247	136,948	149,497	11.6	11.1	9.2

Source: retrieved from CEIC database, 2016

Table 4 GDP per capita and annual growth rate of major cities in China

City	Per capita income after-tax (RMB/Year)				Growth rate (%)		
	2005	2012	2013	2014	2012	2013	2014
Chengdu	11,359	27,194	29,968	32,665	18.0	10.2	9.0
Shanghai	18,645	40,188	43,851	47,710	10.9	9.1	8.8
Beijing	17,653	36,469	40,321	43,910	10.8	10.6	8.9
Guangzhou	18,287	38,054	42,049	42,955	10.5	10.5	2.2
Shenzhen	28,665	40,742	44,653	40,948	11.6	9.6	-8.3

Source: retrieved from CEIC database, 2016

Table 5 Per capital income after tax and annual growth rate of major city in China

City	Food expenditure /person (RMB/Year)			Growth rate (%)		
	2005	2013	2011	2012	2013	2013
Chengdu	3,400	7,394	13.0	9.4	7.6	
Shanghai	4,940	9,823	14.5	8.1	1.7	
Beijing	4,216	8,170	8.0	9.1	8.4	
Guangzhou	5,398	11,240	15.2	8.0	8.5	
Shenzhen	5,309	10,388	9.0	9.9	7.1	

Source: retrieved from CEIC database, 2016

Table 6 Per capita food expenditure and annual growth rate in major city in China

2. The concept and model of Hedonic Price

There are several approaches to determine consumer's preferences to refer to as willingness to pay for a particular product. Theoretically, willingness to pay can be quantified either through revealed preferences which are obtained from experiment or market retail price responses, real purchase data, to cover the range of consumer preferences due to price variation or stated preferences which can be taken from direct surveys of the designed studies by asking the consumers about their willingness to pay for a particular product or by indirect surveys using ranking or sorting of product characteristics by applying conjoint analysis and discrete choice analysis (Breibert, 2006; Wronka, 2004).

The hedonic price analysis, one of the great numbers of approaches, can identify consumer-relevant characteristics to express consumer's preferences. In addition, it is an appropriated approach to estimate implicit prices or price index of a commodity based on the characteristics or attributes of that commodity relevant to consumer's preference by using revealed preferences that are based on real purchase data which has been incorporated information about their characteristics into the product price. The hedonic price analysis has been applied many times to identify characteristics of a product which significantly influence the price. The first contribution to the hedonic price method was done by Waugh (1929) to estimate the relationship the prices of fresh asparagus and the quality (physical characteristics) of that vegetable. Although there were other studies, the major contributions of hedonic method come from the theoretical works towards New Consumer Theory of Lancaster (1966) and the work of Rosen (1974).

Unnevehr (1986) used implicit prices of grain characteristics in terms of physical characteristics (milling quality) such as color, rate of breakage, shape of grain, percentage of chalky grain and purity and chemical characteristics (cooking quality) such as percentage of amylase content, gel consistency to measure softness of rice, Gelatinization temperature (Alkali spread) to identify cooking time and aromato evaluate rice breeding in Thailand, Indonesia and the Philippines and found that demand for grain shape and some chemical characteristics, such as per cent of amylose, varies across these three countries. Kaosa-ard and Juliano (1991) and Kawamura (1999) have used a hedonic price model to study the relationship between physical characteristics of rice such as the length of rice, broken rice, purity and the decision to buy rice and found that physical properties has an influence on consumer decisions to purchase rice. Dalton (2004) conducted a study using hedonic price model at household on the specific features of the rice to find the economic value of the rice attributes in upland rice and found that rice varieties were significantly correlated well with the characteristics of the rice milling, which is consistent with the studies of Adesina and Zinnah (1993) and Adesina and Baidu Forson (1995). UntongAkarapong and Kaosa-ard (2010), analyzed relationship between price and quality of rice in modern trade market in China using hedonic price model with total 102 samples obtained from survey of packed rice in modern trade markets in Shenzhen and Guangzhou. The results revealed that factors had positive impacts on price of rice were the fragrant of HomMali followed by quality of package and rice brand. However, the certification logo of Thai HomMali rice standard was not included in the model and reflected that Chinese consumers do not concern about the certification logo in the short period of marketing. While the study of Sirisupluxana, P. and Bunyasiri, N. I. (2014) found that Thai rice consumers give a priority to physical quality such as purity and percent of broken rice than cooking quality such as fragrance and softness. Therefore, the main idea of hedonic price theory is based on the quality or the attributes of the products and of consumer preference or utility deriving from product characteristics not the product itself.

A typical hedonic price function was employed to analyze the quality (characteristics) of the product on product price and can be indicated as $P_i = f(z_{i1}, z_{i2}, \dots, z_{im})$ where P_i is the price of one unit of i^{th} product and z_{ij} is the j^{th} characteristic ($j = 1, 2, \dots, m$) for one unit of i^{th} product contained. The implicit price or the shadow price of a characteristic (hedonic price) can be obtained from the partial derivative of the price function with respect to a particular characteristic as

$\frac{\partial P_i}{\partial z_{ij}} = \frac{\partial f(z_{i1}, z_{i2}, \dots, z_{im})}{\partial z_{ij}} = p_j(z_{i1}, z_{i2}, \dots, z_{im})$ which indicated that if the amount of particular j^{th} characteristic change the price of i^{th} product will also change holding other characteristics constant. Thus the market price of a product is the sum of all the implicit prices of the quality characteristics (Rosen, 1974).

Generally, the functional form of the hedonic price cannot be derived from the economic theory, empirically the most frequently functional forms use in the hedonic regression such as linear, log-log, or semi-log (Berndt, 1991). The simplest one is a linear form given by (Unnevehr, 1986 and Ladd and Suvannant, p. 505, 1976)

$$P_i = \alpha_0 + \sum_{j=1}^m \alpha_j z_{ij} \tag{1}$$

Where P_i is the price of particular i^{th} product and ε is the error term, z_{ij} is the independent variable of the j^{th} attribute of i^{th} product and α_{ij} are unknown parameters needed to be estimated

$$\frac{\partial P_i}{\partial z_{ij}} \tag{2}$$

The regression coefficient α_{ij} for $j=1,2,\dots,m$ is the marginal change in product price with respect to a change of a particular j^{th} characteristic or the implicit values of each attribute of i^{th} product.

The implicit values are used for estimate the consumer surplus obtained from the attribute of a product that related to the better quality (attribute). As particular product attribute changes the quantity of product will change, causing product demand curve shifted to the right, that is from demand curve DD to D^*D^* (Figure 1.1), if the price of the particular product and all others attribute of the product are given constant. The increase of quantity demanded for consumption is reflected by the increase of consumer utility obtained from each unit of product consumed. The gain of consumer surplus from the quantity of product consumed is represented by the following equation.

$$G = \sum_{j=1}^m (z_{ij}^* - z_{ij}) * \alpha_{ij} \tag{3}$$

Where G is the gained consumer surplus obtained from additional unit of product consumed. α_{ij} is the implicit price of the j^{th} attribute (which derived from equation (2)). z_{ij}^* and z_{ij} are the new value and original value of the j^{th} attribute obtained from one unit of i^{th} product consumed given the implicit price of the j^{th} attribute and the consumer surplus is represented by the shaded area in figure 1 and it can be estimated by equation (4) as follow

$$CS = q_R G + \frac{1}{2} (q_R^* - q_R) G \tag{4}$$

Where CS is the total consumer surplus. q_R^* is the quantity of the product which gives changes in attribute of the product consumed by consumer.

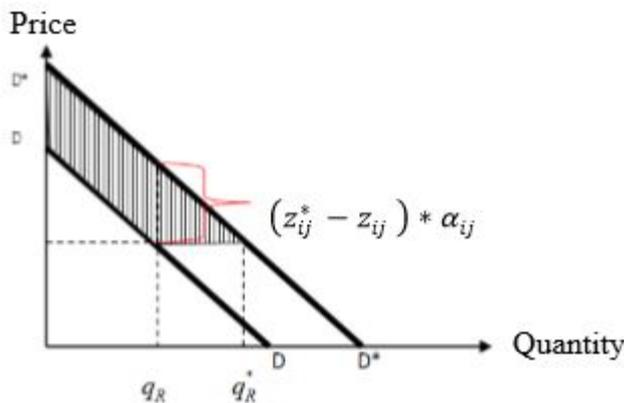


Figure 1 Consumer surplus after quality improvement

3. Research methodology

The research methodology including of sample and approach employed are discussed in the following.

3.1 Population and sample

The research focuses on the rice consumer behavior in Chengdu using purposive sampling by interviewing respondents who willing to participating in the research. The criteria for area and sample selection is based on the distribution of rice consumers with different age groups and are scattering around the rice retailing store such as modern trade (Carrefour), supermarkets in the department stores (Ito, Isetan) and convenient store (HongChi). The primary data was collected through field survey by using structured questionnaire targeted for a total 400 samples however the actual collected samples are 412 samples.

3.2 Research approach

Both qualitative and quantitative approaches are employed in this research. In order to analyze the relationship among factor effecting rice consumption of consumer in Chengdu, the statistical testing of Chi- square, T-test and F-test are employed and the Hedonic price model is constructed for analyzing the relationship between rice quality attributes (such as physical, cooking and eating quality) and the price of rice. After reviewing articles concerning the attributes of rice, the expected effect of attributes on price of HomMaliRice has been listed in Table 7 and will be utilized in the hedonic model.

Attributes	Unit classification	Expected effect
Physical quality		
• Length, width and uniformity	Shape of grain 1-5 (1 = long 5 = short)	+
• Color	whiteness and translucence of rice 1-5 (off white to white) (White kernels, Yellow kernels, Red/under-milled kernels)	+
• Cracks/Rate of broken	% of broken rice: 1-5 (lowest to highest)	-
• Rice standard	1-5 (very few to high)	+
• Purity	presence of foreign matter: 1-5 (very few to high)	+
• New crop rice	1-5 (very old to newest)	+
• Brand image	1-5 (not good to very good)	+
Cooking quality		
• Stickiness (grain cohesion)	Stickiness after cooking 1-5 (not sticky to very sticky)	+
• Grain size after cooking	Size of grain after cooking 1-5 (shot to long)	+
• Swelling capacity	Capacity to enlarge 1-5 (not swell to very good swell)	+
Eating quality		
• Texture of cooked rice	Softness texture Feel/consistency 1-5 (hard to soft)	+
• Flavor/taste	Taste Flavor palatability 1-5 (bad to very good)	+
• Aroma	Aroma Smell/perfume 1-5 (bad to very good)	+

Table 7 Selected attributes of hedonic price analysis and expected relationship between price and the attributes

4. Research results and discussions

The research results are indicted that most respondent are female (60.85 percent of the total sample) as they are likely to be the decision makers of household food purchasing with the average age of 29 year-old. The majority of the respondents are concerned as economic active labor forces and the potential future Thai rice purchaser (54% for 26-55 year-old). Most of the respondents had bachelor degree and higher (49% of the total sample) and the majorities are employers (41%). The average monthly income of the respondents is 5,459 RMB/month, and the highest income is more than 10,000 RMB/month.

4.1 Chengdu consumer preference

Majority of the people in Chengdu purchased packed rice (66.4 % of the total respondents) and only 8 percent purchased un-packed rice. In addition, those in the age group 26-35 year-old buy packed rice more than all other age groups (Table 8).

Type of package	< 25 year-old	26-35 year-old	36-55 year-old	> 55 Year-old
Packaged rice	88 (59.1)	108 (74.5)	33 (67.3)	5 (50.0)
Un-packaged rice	21 (14.1)	7 (4.8)	2 (4.1)	2 (20.0)
Both packaged and un-packaged rice	40 (26.8)	30 (20.7)	88 (24.4)	3 (30.0)

Remark: There is a statistical significant relationship between type of package and age group at 95% confidence level (CI).

Table 8 Frequency and percentage of sample purchased packaged rice and un-Packaged rice

Most of the consumers, 57.4 % of the total respondents, purchased rice at the modern trade (Carrefour and Isetan) followed by the supermarket or convenient. Only few purchased rice at the wholesale market (7.7 percent). Considering the age group of rice buyers, the supermarket and convenient stores are the place where the young people with age of less than 25 year old bought their rice (Table 9).

Location of purchase	Total	< 25 year-old	26-35 year-old	36-55 year-old	> 55 year-old
Modern trade	225 (57.4)	80 (49.1)	99 (63.5)	33 (60.0)	7 (53.8)
Super market/convenient Store	222 (56.2)	101 (62.0)	78 (50.0)	31 (56.4)	8 (61.5)
Wholesale market	30 (7.7)	16 (9.9)	6 (3.9)	5 (9.1)	3 (23.1)

Remark: There is a statistical significant relationship between modern trade and age group at 95% confidence level. The relationship between supermarket and convenient store is also found statistical significant at 90% confidence level. Can answer more than 1 question

Table 9 Frequency and percentage of household rice purchasing classified by purchasing location and age groups

Mostly consumers in Chengdu purchased only Chinese rice. Majority of consumers purchased rice produced in the northeastern province called "Tongbei rice". The second category purchased both Chinese rice and Thai rice, while only few purchased only Thai rice (Table 10). However, the type of rice purchased has no statistically significant relationship with the age group of consumers (Chi-square test equal 7.6, and P-value equal to 0.49).

Age group	Number of respondents			Percentage		
	Buying Chinese rice only	Buying Thai rice only	Buying both	Buying Chinese rice only	Buying Thai rice only	Buying both
Total	237	10	104	67.5	2.8	29.6
< 25 year-old	92	3	41	67.6	2.2	30.1
26-35 year-old	104	3	33	74.3	2.1	23.6
36-55 year-old	31	2	21	57.4	3.7	38.9
> 55 year-old	6	1	6	46.2	7.7	46.2

Table 10 Frequency and percentage of samples buying Chinese rice, Thai rice and both Chinese rice and Thai rice

Consumers who purchased only Thai rice had comparatively higher income and education. The average monthly income for the respondents indicated for purchasing only Thai rice is 17,000

RMB which is higher than those purchased only Chinese rice (5,371 RMB). It was found that there is a statistically significant relationship between household income and the type of rice purchased at the confidence level of 95%. In addition, respondents who purchased only Thai rice had an average year of education of 16 years which is higher than those purchased both Chinese rice and Thai rice (13.8 years). Furthermore, there is a statistically significant relationship between years of education of the household head and type of rice purchased at confidence level of 99%.

There are two popular types of Chinese rice, rice produced in Sichuan province and Tongbei rice. On the average consumers in Chengdu purchase Chinese rice two times a month, around 5-10 kg. per each time with an average price of 6.1 RMB/kg and the most popular size of packed rice is in the range of 5-10 kg. For those who purchase Thai rice, the amount of purchase is averaged at one time a month, around 5-10 kg. With the average price of 11.3 RMB/kg. The popular size of packed Thai rice is 5kg. It is clear that those respondents purchase Thai rice paid a comparatively higher price and higher rice consumption expenditure than those purchased only Chinese rice (Table 11)

Statistics	Chinese rice			Thai rice		
	Quantity purchased per month (Kg.)	Price per Kg. (RMB)	Expenditure per month (RMB)	Quantity purchased per month (Kg.)	Price per Kg. (RMB)	Expenditure per month (RMB)
Average	19.4	6.1	66	14.1	11.3	74.7
Minimum	1	1	5	1	1	3
Maximum	200	20	1,000	150	40	400
Std. Dev.	27.4	3.2	98	25.7	6.2	69.4

Table 11 Descriptive statistics of average monthly expenditure on Chinese rice and Thai rice purchasing

The factors that consumers in Chengdu considered when purchasing Thai rice is the quality of Thai rice, especially the fragrance and the softness, followed by hygiene, brand, and price. All these factors are not different among age group of the respondents and rice type (Table 12-13).

Factors	20-25 year-old		26-35 year-old		36-55 year-old		> 55 year-old	
	Number	%	Number	%	Number	%	Number	%
Price	43	25.9	34	21.5	14	25.5	5	38.5
Hygiene	60	36.1	62	39.2	23	41.8	9	69.2
Quality ⁽¹⁾	137	82.5	130	82.3	45	81.8	11	84.6
Brand	38	22.9	40	25.3	14	25.5	5	38.5

Remarks: ⁽¹⁾ Softness and fragrance of rice.

Table 12 Frequency and percentage of most important factors in Rice purchasing classified by age groups

Factors ⁽⁴⁾	Total sample		Buying Chinese rice only		Purchased Thai rice ⁽²⁾	
	Number	Percentage	Number	Percentage	Number	Percentage
Price	97	24.3	57	24.4	29	25.4
Hygiene	159	39.8	93	39.7	47	41.2
Quality ⁽³⁾	327	81.8	197	84.2	92	80.7
Brand	97	24.3	93	39.7	31	27.2

Remarks: ⁽¹⁾ Respondent can answer more than one question ; ⁽²⁾ Either purchased Thai rice only or purchased both Thai rice and China rice; and ⁽³⁾ Softness and fragrance of rice

Table 13 Frequency and percentage of important factors in deciding of Rice buying classified by types of rice consumed

The important physical characteristics that consumer in Chengdu considered when purchased rice are the cleanness (extremely important), followed by rice standard (extremely important), logo of safety/hygiene certification (very important), new crop rice (very important) and color of rice kernels (very important). While those consumers who buy only Thai rice concerned about the

special rice characteristic information (extremely important), followed by cleanness (extremely important), new crop rice, the location of packing, logo of safety/hygiene certification and rice standard, respectively. However, the location of packing revealed that the score for packed locally and packed abroad are equal and indicated a very important factor (Table 14). This reflected that rice consumers in Chengdu are mostly unaware of the difference of packing location which is indicated by the barcode on the package. The barcode started with number 69 indicated packed locally, while starting with number 885 means packed abroad. Furthermore, consumers who buy Thai rice only prefer new crop rice compared to those who buy only Chinese rice and concern more about type of packaging (there is a statistically significant difference among group of buying).

Considering the difference among the three groups of purchasing rice (buying Chinese rice only, buying Thai rice only, and buying both Chinese rice and Thai rice), it was found that factors such as new crop rice, color of rice kernels (white and transparent), type of packing, rice standard, logo of safety/hygiene certification, detail of cooking method, history of rice/production process, and special property of rice information were statistically significant difference among this three groups. It is interesting to note that respondents buying Chinese rice only given more weight or score of the importance of attributes on old crop rice, percent of broken rice, color of rice kernels (white and transparent), rice standard, logo of safety/hygiene certification, history of rice/production process, and special rice characteristic information more than those respondents who buying only Thai rice (Table 14).

Physical characteristics	Total sample	Buying Chinese rice only	Buying Thai rice only	Buying both	F-Stat
Packed locally	3.36	3.41	4.00	3.19	0.729
Packed abroad	3.40	3.38	4.00	3.39	0.838
New crop rice*	4.05	4.08	4.10	3.97	2.388
Old crop rice	3.18	3.28	3.00	2.97	0.920
Percentage of broken rice	3.66	3.72	3.10	3.57	0.650
Length of rice kernels	3.41	3.35	3.50	3.52	1.407
Color of rice kernels***	3.89	3.95	3.86	3.78	4.723
Cleanness	4.51	4.56	4.29	4.41	0.413
Type of packaging** (vacuumed or not)	3.62	3.64	3.80	3.55	3.603
Rice Standard***	4.24	4.39	3.89	3.94	6.760
Logo of safety/hygiene certification	4.05	4.13	3.90	3.87	1.976
Detail of cooking method *	3.35	3.37	3.40	3.30	2.561
History of rice/production process**	3.52	3.61	3.90	3.29	3.603
Special rice characteristic information***	3.57	3.52	4.33	3.31	5.853
Brand image of the rice	3.56	3.65	3.60	3.36	0.758

Remarks: Score 1-1.8=unimportant; 1.81-2.6=somewhat important; 2.61-3.4=quite important 3.41-4.2 very important; and 4.21-5.0=extremely important. Where: *= significant at 90% CI; **=significant at 95% CI; and ***=significant at 99% CI

Table 14 Average score of physical characteristics that consumers emphasized in Rice purchasing classified by rice-type purchased group

The physical factors that consumers in Chengdu placed important in purchasing rice are different among age groups such as factors on percentage of broken rice and type of packaging. Noticeably, the higher the age group gives higher weight on the importance of the percentage of broken rice, followed by the younger age group (those between 36 and 55 year old places importance level at score of 3.83, 26-35 year old places importance level at score of 3.68) and less than 26 year old places importance level at score of 3.47, respectively. The similar ranking also found in the type of packing (Table 15)

Physical characteristics	<26	26-35	36-55	>55	F-test
	year-old	year-old	year-old	year-old	
Packed locally	3.31	3.28	3.38	3.64	0.584
Packed abroad	3.27	3.39	3.43	3.67	1.380
New crop rice	3.92	4.05	4.25	3.67	1.202
Old crop rice	3.03	3.27	3.42	2.83	1.596
Percentage of broken rice*	3.47	3.68	3.82	3.25	2.122
Length of rice kernels	3.33	3.31	3.52	3.75	0.594
Color of rice kernels	3.8	3.81	4.00	4.27	0.910
Cleanness	4.58	4.47	4.36	4.80	1.054
Size of packed rice (5 Kg.)	3.37	3.16	3.62	3.38	1.576
Type of packaging***	3.51	3.65	3.91	3.64	5.227
Rice Standard	4.24	4.28	4.20	3.75	0.789
Logo of safety/hygiene certification	4.09	4.11	3.89	3.92	0.432
Detail of cooking method	3.36	3.41	3.31	3.08	0.187
History of rice/production process**	3.57	3.59	3.43	3.17	0.801
Nutrition information	3.76	3.74	3.6	3.42	0.353
Special rice characteristic information	3.55	3.67	3.35	3.33	1.013
Brand image of the rice	3.34	3.37	3.42	2.78	0.674

Remarks: Score 1-1.8=unimportant; 1.81-2.6=somewhat important; 2.61-3.4=quite important 3.41-4.2 very important; and 4.21-5.0=extremely important. Where: *= significant at 90% CI; **=significant at 95% CI; ***=significant at 99% CI

Table 15 Average score of physical factors that consumer emphasized in Rice purchasing classified by age-group

The most important characteristic of rice cooking and eating quality considered by the Chengdu rice consumers are taste of rice, followed by softness after cooking, and the fragrance, respectively. The ranking of these characteristics are the same among the respondent groups; however, those consumers who purchased Thai rice only concern more on taste and fragrance respectively. In addition the same pattern of ranking is also found with statistically insignificant among respondents classified by age groups (Table 16 to 17)

Cooking and eating quality	Total sample	Buying Chinese rice only	Buying Thai rice only	Buying both	F-Test
Taste	4.30	4.43	4.50	4.34	0.217
Fragrance	4.13	4.14	4.20	4.11	0.066
Softness after cooking	4.19	4.22	3.70	4.16	1.147
Stickiness after cooking	3.99	4.03	3.70	3.93	1.155
Long lasting of the softness	3.86	3.90	3.80	3.77	1.027
Grain size after cooking	3.73	3.75	3.20	3.74	1.188
Fluffy (Swelling) rice after cooking	3.92	3.92	3.50	3.98	0.441
Uniformity of quality after cooking	3.96	3.96	3.60	3.98	0.380

Remarks: Score 1-1.8=unimportant; 1.81-2.6=somewhat important; 2.61-3.4=quite important 3.41-4.2 very important; and 4.21-5.0=extremely important. Where: *= significant at 99% CI; **=significant at 95% CI; ***=significant at 90% CI

Table 16 Average score of important factors of cooking quality of rice those consumers emphasized classified by group of rice-type purchased

Cooking and eating quality	<26 year-old	26-35 year-old	36-55 year-old	>55 year-old	F-test
	Taste	4.40	4.36	4.41	
Fragrance	4.10	4.08	4.09	4.08	0.271
Softness after cooking	4.27	4.14	4.13	4.46	0.964
Stickiness after cooking	4.00	3.93	3.89	4.05	0.467
Long lasting of the softness	3.89	3.81	3.98	3.83	0.453
Grain size after cooking	3.71	3.66	3.75	4.08	0.525
Fluffy (Swelling) rice after cooking	3.91	3.82	3.98	4.08	1.352
Uniformity of quality after cooking	3.93	3.99	4.09	4.00	0.498

Remarks: Score 1-1.8=unimportant ;1.81-2.6=somewhat important; 2.61-3.4=quite important 3.41-4.2 very important; and 4.21-5.0=extremely important

Table 17 Average score of important factors of cooking quality of rice those consumers emphasized classified by group of rice-type purchased

The empirical results from Table 18 showed that the most important psychology factors rated

by all rice consumers in Chengdu is self-fulfillment followed by fun and enjoyment of life and self-respect, respectively. The average importance score of the psychological factor on fun and enjoyment of life was differed among the respondents whereas respondents purchased Thai rice placed more important than those respondents purchased Chinese rice only (Table 18).

Psychological factors	Total sample	Buying Chinese rice only	Buying Thai rice only	T-stat	Sig.
Self-fulfillment	4.20	4.25	4.10	0.70	0.24
Being well respected	3.82	3.81	3.85	0.39	0.35
Fun and enjoyment of life *	4.14	4.09	4.24	1.44	0.08
Self-respect	4.15	4.15	4.13	0.09	0.46

Remarks: Score 1-1.8= unimportant; 1.81-2.6=somewhat important; 2.61-3.4=quite important 3.41-4.2 very important; and 4.21-5.0=extremely important. * significant at 90% CI

Table 18 Average score of psychological factors that consumers emphasized classified by rice-type purchased

4.2 Effects of rice attributes on price of Thai HomMali rice (Hedonic model)

After testing for multicollinearity among all attributes and functional form of the model, the best model is in the linear form. The Least Squares (LS) has been used to analyze the relationship between the rice price and its attributes. It is hypothesized that rice price depends upon two main characteristics. The first one is physical characteristic of rice kernel which is visible from the appearance and rice package which included color of rice kernels in terms of white and transparent (COLOR), percentage of broken rice (PERCENTBR), length (long) of rice kernels (LGRAIN), new crop rice (NEWRICE), rice standard (RSTANDARD), and brand of the rice (BRAND). The second is chemical characteristics which affect the cooking and eating quality. These can be characterized by softness after cooking (COOKSOFT), fragrance of rice after cooking (AROMA), and rice taste flavor (TASTE)

The estimated results found that the implicit price of the rice attributes (or characteristics) in China affected by both physical and chemical characteristics. All these characteristics are statistically significant except the color of rice kernels (COLOR). In addition, the Chengdu rice consumers expressed their satisfaction on the studied characteristic according to the expectation and they are willing to pay premiums for better rice attributes and it seem to be that Chengdu rice consumers concerns and value more on cooking and eating quality (AROMA) than physical characteristic (BRAND)(Table 19). These results were contrast with the study of Kaosa-ard and Juliano (1991), Kawamura (1999), Untong, P and Kasosa-ard (2010) and Sirisupluxana, P and Bunyasiri, N. I (2014) found that a consumer pay more based on physical attributes.

Items	Estimated Coefficient	T-stat
Dependent variable: price of rice (RMB/kg.)		
Constant term	3.7167	2.4781
Color of rice kernels (COLOR)	0.0607 ^{ns}	1.3532
Percentage of broken rice (PERCENTBR)	-0.3739 ^{***}	-2.3025
Length (long) of rice kernels (LGRAIN)	0.4274 ^{**}	2.0703
New crop rice (NEWRICE)	0.4546 ^{***}	3.1592
Rice standard (RSTANDARD)	0.4472 [*]	1.9265
Brand of rice (BRAND)	0.8912 ^{**}	2.0805
Softness after cooking (COOKSOFT)	0.7826 ^{**}	2.2365
Rice taste flavor (TASTE)	0.4119 [*]	1.8958
fragrance of rice after cooking (AROMA)	0.9165 [*]	1.6955
R ²	0.7722	
Adjusted R ²	0.7503	
Durbin Watson (DW)	1.5162	
Number of samples	104	

Remarks: * = significant at 99% CI; ** = significant at 95% CI; *** = significant at 90% CI

Table 19 Estimated coefficients or implicit price of hedonic price regression

5 Summary and recommendation

The study found that rice consumers in Chengdu always purchase rice in the modern trade

retailers, supermarket in the department store, and convenient store and often buy Chinese rice (Tongbei rice). The important factors in deciding buying rice are quality of rice (fragrant and softness of rice). The main reason for buying Thai rice is the taste of Thai rice. It is also found that those Thai rice buyer comparing with those buying Chinese rice are having comparatively high income and education, and having higher degree of joyful lifestyle, especially, for those younger and labor-productive age group between 26 and 35 year old. Thus, Thai rice target group in Sichuan Province would be young consumers and consumers with more income and more year of education.

The study on the hedonics price analysis found that both physical characteristics and chemical characteristics are significantly influence the rice price. The physical characteristics that will increase the price of rice are less percentage of broken rice, longer length of rice kernels, and newer crop of rice, higher rice standard, and higher-end brand of rice. Whereas the chemical characteristics (cooking and eating quality) has the positive impact on rice price are better softness of rice after cooking, more taste flavor and more aroma. In addition, fragrance or aroma has more impact on rice price followed by rice brand image. Thus to enhance the Thai rice market in Chengdu Thai rice breeders have to keep the consistency of fragrance, taste and softness of HomMali rice which are the major factors that the Chinese consumer needed and Thai rice traders have to produced packed rice with brand image according to the taste of Chengdu consumers. In addition, Thai government and traders should promote and create the identity and difference of HomMali rice from Chinese rice by providing all information of Thai HomMali rice to consumers, particularly the difference quality and this information should be summarized in Chinese and printed on the rice package. Furthermore, Thai traders should built consumers' trust on the uniformity of taste and fragrance of HomMali rice and should be in cooperation with the modern trade retailers to provide consumer with actual experience in eating and testing of Thai HomMali rice to enhance Thai rice market share in Sichuan Province.

6 Further study

To get more information about the consumer perspectives on attributes of Thai rice and Chinese consumer preference in Sichuan Province, the replication of this study should be implemented in surrounding cities of Chengdu.

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